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THE USE OF AGRICULTURAL FERTILIZERS BY THE AMERICAN INDIANS AND THE EARLY ENGLISH COLONISTS.[1]

BY G. BROWNE GOODE.

IN the course of a somewhat exhaustive study of the natural and economical history of that member of the herring family known on our Atlantic coast under such various names as "menhaden," "pogy," "bony-fish," "moss-bunker," "white-fish," "bay-alewife," "bug-fish," "yellow-tail" and "fat-back," *Brevoortia tyrannus* (Latrobe) Goode, my attention was incidentally called to a matter of some interest to anthropologists—the use of fish fertilizers in agriculture by the Indians of New England and Virginia. The menhaden is, at the present day, the source of an immense annual product of commercial fertilizers. In the year 1878 between 900,000,000 and 1,000,000,000, or perhaps 200,000 tons of these fish were captured between Cape Henry and the entrance to the Bay of Fundy. A large part of the catch is consumed by the numerous oil and guano factories of Maine, Rhode Island, New York, Connecticut and Virginia. After the oil has been extracted the remainder is dried and sold to farmers and to the manufacturers of super-phosphates and other artificial fertilizers, who use it as a "base for nitrogen." Agricultural chemists, in the rating of commercial manures, value the nitrogen contained in them at twenty-five cents a pound. The amount of nitrogen derived from menhaden in 1875 was estimated to be equivalent to that contained in 60,000,000 pounds of Peruvian guano, the gold value of which would not have been far from $1,920,000.

[1] Read before the Anthropological Society of Washington, November, 1879.

In studying the development of this great industry, my attention was naturally directed toward a search for the beginning of the employment of fish in agriculture. As I have narrated elsewhere at considerable length,[1] the present oil and guano industry originated in Maine, about the year 1850, through the experiments of an old woman, who, while boiling some fish for chicken feed, observed the accumulation of a scum of oil upon the surface of the water; and about this time, or a little later, small factories were established in Connecticut and Eastern Long Island. Long before this, however, the farmers of New England and New York were accustomed to manure their corn and potato fields with the entire fish, in a raw state. This custom prevails to a great extent, even to the present day, notwithstanding that the experience of thoughtful agriculturists has shown it to be injurious. The usual method in sowing corn is to place an entire menhaden in each hill, together with the few grains of seed, and in planting potatoes to lay down a continuous row of fish, head to tail, in the furrows, before the potatoes are put in. The oil thus introduced with the flesh into the earth is entirely useless as a fertilizer, and permeating the soil renders it peculiarly liable, first to become soggy and heavy, and then to bake hard and crack with the heat of the sun. Many farms in Connecticut and Long Island are pointed to as having been ruined by this mode of planting.

My friend Prof. Atwater has searched the annals of European agriculture, and can find no record of the use of fish fertilizers before 1850, since which time they have been employed to some extent in Norway, England, Prussia and France. In America, however, their use dates back to the first colonization, and doubtless, as I shall show below, among the Aborigines, long previous to the discovery of the country.

Important, and in fact unanswerable, evidence is supplied by the etymology of the two names, "menhaden" and "pogy" or "poghaden," in use in different parts of New England. I quote from a letter received from Mr. J. Hammond Trumbull, in 1874:

"In response to yours of the 14th (December), respecting the local names of *Brevoortia*, about all I can give you is in my note to the new edition of Roger Williams' Key, Ch. XIX. Williams names together, among spring fish, '*Aumsoûg* and *Munnawhat-*

[1] A History of the Menhaden, etc., in Report U. S. Commissioner of Fisheries, Part v (for 1877), 1879, pp. 1–529; pp. 161 *et seq.*

teaûg.' Under the former name are included several species of the herring tribe, *aum'su* (plural *uaums'uog*) meaning 'small fish,' *Munnawhatteaûg* corrupted to *menhaden*, means literally 'fertilizer' (that which manures), this name was applied to the herring and alewife as well as the 'menhaden' proper—all these species being used by the Indians for manuring their cornfields.

"In the northern and eastern parts of New England, the *Brevoortia* is commonly called *pauhagen*, and probably in some localities 'poghaden' (as you write it and which is nearer the Indian original), though I have not heard it so pronounced by Eastern fishermen. This name in the Eastern dialects has precisely the same meaning as 'menhaden' (or rather *Munnawhatteaûg* in Southern New England). The Abnaki (*i. e.*, coast of Maine) name was *pookagan* as Rasles wrote it, and the verb from which it is derived he translated by '*on engraisse la terre*.'"

I next appeal to the records of the Colonies. In Governor Bradford's "History of Plimouth Plantation," is given an account of the early agricultural experiences of the Plymouth colonists. In April, 1621, at the close of the first long dreary winter, "they (as many as were able) began to plant their corne, in which service Squanto (an Indian) stood them in great stead, showing them both ye manner how to set it and after how to dress & tend it. Also he tould them, axcepte they got fish & set with it (in these old grounds) it would come to nothing; and he showed them yt in ye middle of Aprili, they should have store enough come up ye brooke by which they begane to build and taught them how to take it."[1]

Another allusion to the practice of the Indians in this respect may be found in George Mourt's "Relation or Journal of the Beginning and Proceedings of the English Plantation settled at Plimoth, in New England, by certain English Adventurers both Merchants and others. * * * London, 1622." "We set the last spring some twenty acres of Indian corn, and sowed some six acres of barley and pease, and, according to the manner of Indians, we manured our ground with herrings, or rather shads, which we have in great abundance and take with great ease at our doors. Our corn did prove well, and God be praised, we had a good increase of Indian corn, and our barley indifferent good."[2]

[1] Coll. Mass. Hist. Soc., 4th Series, III, 1856, p. 100.

[2] Coll. Mass. Hist. Soc., 2d Series, IX, 1832, p. 60.

The fish made use of by the early settlers of Massachusetts were doubtless in large part the spring alewife, *Pomolobus vernalis*, and perhaps also the summer alewife, *P. æstivalis*, and an occasional shad, *Alosa sapidissima*.

I can find no other direct allusions to the Indians in this connection, but may quote two passages relating to the practices of the early colony, which are quite significant in the light of those already presented. Thomas Morton, in his "New England Canaan," London, 1632, wrote of Virginia: "There is a fish (by some called shadds, by some, allizes) that at the spring of the yeare passe up the rivers to spawn in the pond, & are taken in such multitudes in every river that hath a pond at the end that the inhabitants doung their grounds with them. You may see in one township a hundred acres together, set with these fish, every acre taking 1000 of them, & an acre thus dressed will produce and yeald so much corn as 3 acres without fish; & (least any Virginea man would infere hereupon that the ground of New England was barren, because they use more fish in setting their corne, I desire them to be remembered, the cause is plaine in Virginea) they have it not to sett. But this practice is onely for the Indian maize (which must be set by hands), not for English grain: & this is, therefore a commodity there."

This passage is very interesting, describing as it does the use of fish fertilizers in Virginia two hundred and fifty years ago or more. To one who is acquainted with the habits of the herring family in the Virginia rivers and the persistency of local names, there can be little doubt that many menhaden were used as well as shad and the two kinds of river herring, all of these being common, in spring, in all the streams tributary to Chesapeake bay.

In Edward Johnson's "Wonder-Working Providence of Sion's Saviour in New England, being a Relation of the Firste Planting of New England in the yeare 1628," London, 1654, written in 1652, the author says: "But the Lord is pleased to provide for them (the colonists) great store of fish in the Spring-time, especially alwives, about the bignesse of a herring. Many thousand of these they used to put under their Indian corne, which they plant in hills five foot asunder; and assuredly when the Lord created these corne, Hee had a special eye to supply these His people's wants with it, for ordinarily five or six grains doth produce six hundred."

The following order from the records of the town of Ipswich, May 11, 1644, illustrates in a comical way the customs of the early colonists: "It is ordered that all the doggs for the space of three

weeks after the publishing hereof, shall have one legg tyed up, and if such a dog shall break loose and be found doing any harm the owner of the dogg shall pay damage. If a man refuse to tye up his dogg's legg, and hee bee found scraping up fish in a cornefield, the owner thereof shall pay twelve pence damage beside what ever damage the dogg doth. But if any fish their house lotts and receive damage by doggs, the owners of these house lotts shall bear the damage themselves."

From this time until the latter part of the last century, I can find no reference to the use of fish fertilizers, but there is no reason to doubt that the customs of old have been handed down by the local agriculturists from generation to generation.

I have been much astonished to find that the use of fertilizers by the uncivilized races of man has not been more frequently observed. Dr. Rau, with his extensive acquaintance of ethnological literature, tells me that he has met with but one allusion of the kind, that being in the writings of Garcilasso de Vega, who states that the Peruvians used bird guano for the purpose of manuring their plantations.[1]

Bancroft refers to one instance of the use of fertilizers by the

[1] "They used to dung their Lands, that they might make them fruitfull, and it is observable, that in all the Valley about *Cozco*, and in the hilly Countries, where they sowed *Mayz*, they esteemed the best manure to be Man's Dung; and to that end they saved and gathered it with great care, and drying it, they cast it upon their Land before they sowed their *Mayz*. But in the Country of *Collao*, which is above one hundred and fifty Leagues long, which, by reason of the coldness of the Climate, doth not produce *Mayz*, though it bear other sort of Grane, there they esteem the Dung of Cattle to be the best manure and improvement.

"By the Sea-coast, from below *Arequepa*, as far as *Tarapaca* which is above two hundred Leagues, they use no other Dung, but such as comes from the Sea-birds, of which there are great numbers and incredible flocks on the Coast of *Peru;* they breed in little Islands, which lie in the Sea, and are unpeopled, where they lay such heaps of Dung, that at a distance they seem to be Hills of Snow, in the times of the *Incas*, who were Kings, great care was taken of these Birds in the season of their Breeding; for then on pain of death no Man was to enter on those Islands, lest they should disturb the Birds, or spoil their Nests; nor was it lawfull to take or kill them at any time, either off or upon the Island.

* * * * * * * * * *

"Howsoever in other parts of that Coast, and in the Low Countries of *Atica*, *Aliquipa*, *Villacori*, *Malla* and Chilca, and other Vallies, they dung their grounds with the Heads of a small fish, like our Pilchards, and with no other soilage.

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"There are such quantities of Pilchards cast up by the Sea at those seasons, as are not onely sufficient for the Food of Man, and Birds, and for dunging the earth, but even to lade many Ships, if occasion should require. It is said that this Fish is chased ashore by some Dolphins, or greater Fish; be it by what means it will, the advantage is great, and the Providence of God is admirable in these His Blessings towards His poor Creatures."

Garcilasso de la Vega: The Royal Commentaries of Peru. Translated from the Spanish by Sir Paul Rycant, Lond. 1688, pp. 135–36.

Indians on the Pacific coasts. In describing the customs of the Maya tribes of Yucatan (Vol. ii, p. 717) he paraphrases a translation of the Quiché MS. by Brasseur De Bourbourg, in relation to the culture of maize by them: "And from the time of its traditional discovery by Gucumatz or Quetzalcoatl (the creator and former) down to the conquest by the Spaniards, and even down to the present time, the yellow and white maize, or their several varieties, have been the chief reliance of the Maya as of the Nahua nations for daily food. Every year, during the latter month of the dry season, from March to May, the farmer busied himself in preparing his *milpa* or cornfield, which he did by simply cutting or up-rooting the dense growth and burning it. The ashes thus produced were the only fertilizer ever employed, and even this was probably never needed in this land of tropical fertility. Just before the first rain fell, equipped with a sack of seed-maize on his shoulder and a sharpened stick in his hand, he made holes at regular intervals among the ashes, and in each deposited five or six grains, covering it with the same instrument, aided perhaps with his foot," etc., etc. This is evidently accidental rather than intentional fertilization, the main object of the burning being doubtless to clear away the obstructions to planting the seed. Dr. Rau also showed me accounts of the agriculture of various American tribes, and particularly a very full one of the culture of maize by the Iroquois, in Lafittau's "Mœurs des Sauvages Americains," Paris, 1724, none of which referred in any way to the use of manure.

While traveling on the north shore of Lake Superior last summer, Prof. Atwater learned that the Indians of that region employ, to some extent, white fish and lake trout in manuring their fields. Mr. W. H. Dall tells me that a rude system of agriculture is practiced by the Indians of Alaska, a system learned from the Russians since their occupation of the territory.

I have presented these few notes, not as a contribution to knowledge, but to call attention to a subject which seems to have been neglected in a most unaccountable manner. Can it be that the aborigines of the Northern Atlantic States are the only uncivilized people who have understood the use of agricultural fertilizers? Fish fertilizers naturally are inaccessible except to peoples living on large bodies of water abounding in schools of fish, which may be taken with ease in quantities greater than are

needed for use as food. Not less interesting, however, would be instances of the use of organic refuse derived from other sources. Can it be possible that the agricultural Indians of America, such, for instance, as the Moquis, have never thought of making this very obvious application of their domestic animals? When did the Aryan races take their first steps in provident agriculture? These questions must be extremely important to those who are studying the development of culture and civilization.

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A SKETCH OF COMPARATIVE EMBRYOLOGY.

BY CHARLES SEDGWICK MINOT.

IV.—THE EMBRYOLOGY OF SPONGES.

DURING the past six years our knowledge of the structure and development of sponges has made sudden and very great progress, perhaps greater than has occurred in any other department of zoölogy during the same period. The advance was introduced by the publication, in 1872, of Haeckel's monograph of the calcareous sponges. That work has been followed, in Germany, England, France and Russia, by numerous memoirs, among which the series of articles by Franz Eilhard Schulze stand first by their accuracy, their clearness, the beauty of the illustrations and the good temper (sometimes wanting in German scientific publications) of the criticisms on other investigators, but above all, by the value of the discoveries they announce. I think no zoölogist can read Schulze's papers without enjoying their rare combination of merits.

One of the results of these numerous recent researches has been to show that Haeckel's work is inaccurate to a startling extent. He figures in detail things he cannot have seen, because they do not exist, and he describes phenomena that do not occur. His fault is to make very positive statements and give very diagrammatic figures after a hasty examination, consequently his writings contain so numerous errors, sometimes about fundamental points, that even a positive statement of his, until confirmed by other investigators, has no authoritative value. This defect is most seriously to be deplored, for Haeckel is unquestionably one of the most daring and original thinkers of the modern speculative school, and many of his quickly made generalizations have

proved extremely fruitful, as others have been useless or misleading. Therefore, in spite of Haeckel's great and unusual endowments, which every one must recognize and admire, it is unsafe to quote his writings as authorities in matters of fact.[1] Having given my own opinion, I may add that while many of the younger naturalists bestow an almost unqualified admiration on Haeckel, several distinguished zoölogists severely condemn him as unscientific.

In order to understand the embryology of sponges, it is necessary to consider briefly their structure. The sponges of commerce are merely the skeletons of the living animals, the soft portions having been removed by maceration. During life the fibres, which make up the skeleton, are all covered by cells. The mass of the sponge is permeated by intercommunicating canals, connected with the exterior by numerous openings upon the surface, these openings are of two kinds, smaller ones called *pores*, by which currents of water enter the canals or tubes, and larger ones, or in some cases a single orifice, the *osculum*, through which the water passes out. The entire surface of the canals is lined by a continuous layer of cells, the *entoderm*. Over definite areas of this lining the cells are cylindrical, have a so-called collar, and are provided, each, with a single long sweeping cilium, or *flagellum (geissel)*, while over the intervening parts, the lining is composed of simple flat polygonal cells. In a few sponges *(Ascones)* the whole canal system is carpeted by flagellate cells. The flagella maintain the currents of water, sweeping in the particles of food, which are seized by the sponge as the water runs through. The external surface is entirely covered by a continuous stratum of flat polygonal cells, the ectoderm, between which and the canals lies the thick middle layer or mesoderm, in which the skeleton and the sexual products are developed.

The mesoderm is composed of numerous independent cells, each separated from its neighbors by amorphous intercellular substance, the specific character of which varies from species to species. Its consistency may be so slight that the cells can crawl about through it, like Amœbas. A certain portion of these cells are transformed into the genoblasts; usually either only eggs or only spermatozoa are produced in a single individual, but of those sponges, whose sexuality is known, a few are hermaphrodite.

[1] In Huxley's Anatomy of Invertebrates, the chapter on sponges is based on Haeckel's work and contains several important errors.

The various kinds of sponges are distinguished principally by their external shape, and the peculiarities of their skeleton and canal system. The form from which all sponges may be deduced is the Olynthus type, which has the following characteristics: 1, it is attached by its base; 2, there is a large vertical central cavity, which, 3, communicates with the exterior at the upper end, through the osculum, and 4, at the sides through the secondary canals and pores. Modifications, besides those before mentioned, occur in the relative size of the main cavity, and by the formation of additional oscula.

The principal kinds of sponges may be tabulated as follows:

A. Without any skeleton.....Myxospongiæ.
B. With horny fibers (bathing sponges).....Spongidæ.
C. With siliceous spicules (several distinct families)..siliceous sponges.
D. With calcareous skeleton.....Calcispongiæ.

The *Physemaria*, which Haeckel described as multicellular organisms, representing a permanent adult sponge-like gastrula condition, have excited the greatest interest among zoölogists. Recent investigations,[1] however, render it probable that Haeckel's description is entirely erroneous, and that these animals are really multinucleolate Rhizopods.

The *gemmulæ*, or winter buds, are not organs of sexual reproduction, but rather of regeneration. The tissues hibernate in a simplified condition, forming germ masses, the so-called buds; in the spring the sponge is regenerated by the renewal of its histological differentiation.

The formation of the egg presents no features requiring special comment from us. No polar globules have been discovered. Since the eggs and spermatozoa are ripe at the same time, the ova probably require to be fertilized, but I think no stage of the act of impregnation has yet been observed. The egg early becomes enclosed in a special capsule or follicle, developed by the neighboring cells of the mesoderm disposing themselves in a continuous layer around it. Within this follicle segmentation and the development of the embryo take place. It is a singularity of sponges, without a parallel among other animals, that the egg becomes the embryo without quitting its seat of formation—the follicle in which it grows up.

The sponge larva escapes from the body of the parent by

[1] E. Ray Lankester, Quart. Journ. Micros. Sci. 1879.

bursting the walls of the follicle, passing into the canal system, and escaping through one of the pores. At the time of its birth, the larval sponge has very distinctive peculiarities, and differs strikingly from all other larvæ.

The larva, when hatched, is egg-shaped (Fig. 16), the larger end is composed of large cells with granular contents, which hide the nuclei, while the pointed end consists of small cells, each of which bears a long vibratile hair, or flagellum. It is by these that the larva swims. During segmentation, however, the cells are all more or less alike, and the differentiation takes place in some species earlier, in others later, so that in some sponges *(Halisarca)*, there is even a stage in which the whole surface of the larva consists of small cells, and later, those cells around the large pole of the egg grow bigger and granular. Again, in some forms (e. g. *Chalinula)* the difference between the two sets of cells is much less, and the small cells cover a proportionately much larger area than in the embryo figured (Fig. 16).

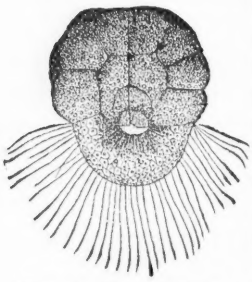

FIG. 16 —Egg-shaped larva, youngest free-swimming stage. *Sycandra raphanus*, after F. E. Schulze. About 530 diam.

There are also cells in the interior of the embryo, leaving, however, in certain cases a central cavity. Schulze states that in *Sycandra* there are no central cells, but Metschnikoff describes and figures them. These central cells are regarded by several authors as the primitive mesoderm.

The metamorphosis of the larva into the sponge has been observed in but very few species. The change takes place according to two distinct types, which cannot at present be brought into relation with one another, because in the first *(Sycandra)*, the large cells form the ectoderm, and the small cells the entoderm, while in the second *(Chalinula* and *Halisarca)*, the destiny of the two sets is exactly reversed, the small ciliated cells remaining external, the large cells becoming internal. In the latter case the embryo attaches itself by its broad end to a solid body, the small cells grow over the whole of the exposed surface; a branching cavity is formed in the interior, and pores and an osculum break through. There cannot be said to be any gastrula stage at all, nor does the osculum answer to an opening formed

by invagination. The skeleton begins to appear about the time the larva fixes itself.

In the other type of development, which has been observed in the higher calcareous sponges, there is both a temporary *pseudo-gastrula*, and a permanent gastrula differently formed, which is directly metamorphosed into the permanent sponge. The pseudo-gastrula normally occurs only before the larva leaves the follicle of the parent body, and arises by the turning in of the large cells, just as the finger of a glove may be inverted; the larva then appears like a cup formed of two membranes, the outer of small cells, the inner of large. Before long, however, the large cells are everted, and the embryo (Fig. 16) reassumes the characteristic egg-shape, and soon leaves the parent, swims about freely for two or three days, and finally permanently attaches itself.

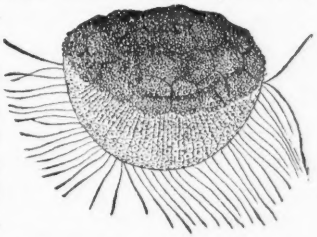

FIG. 17.—Older stage of Fig. 16.

While still free, it broadens, and its long axis shortens (Fig. 17), whereby the large cells begin to grow over the small ones, which are gradually pushed in more and more until they are fairly invaginated. The large cells advance further, gradually constricting the opening until it becomes quite small. Viewed from the oral side, at this stage, the embryo presents the appearance indicated by the outline, Fig. 18, *A*.[1] At this stage the larva fixes itself by its oral end. The cells around

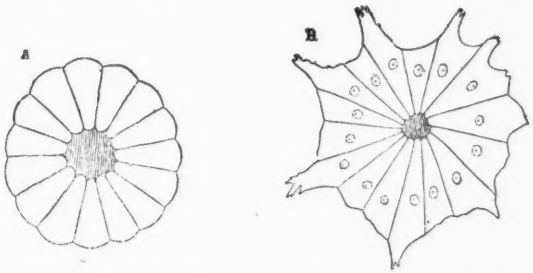

FIG. 18.—*A*. Oldest free-swimming stage, view of oral surface. *B*. The same after attachment. Larva of Sycandra, after F. E. Schulze, magnified about 240 diam.

the mouth nestle against the underlying surface, and send out

[1] In nature the upper and inner parts show through, rendering the outlines much less distinct.

from their external edges hyaline amœboid processes, which probably help the larva to hold on (Fig. 18, *B*). The central ends of the cells approach one another, meet and close the mouth. Fig. 19 presents a side view of a larva in this stage, and shows the inner cavity *c*, now closed; its lining of small cells *b*, and the exterior layer of granular cells *a*, the arrangement of which is particularly obscure, but they ultimately make the ectoderm and mesoderm.

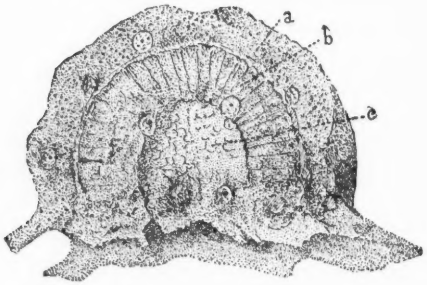

FIG. 19.—Vertical optical section of the attached larva of *Sycandra raphanus*. After F. E. Schulze, magnified about 500 diam.

The development now proceeds by the vertical elongation of the sponge to a cylindrical shape; the formation of a large secondary opening, the osculum at the upper end, and of small openings, *pores*, around the sides, leading into secondary tubes, which communicate with the large central cavity; finally the development of the skeletal spicules and of the mesodermic intercellular substance. The first spicules that appear are simple rods tapering towards both ends, and slightly curved. They lie nearly parallel to the external surface, scattered irregularly. Three and four rayed spicules also soon appear, and the whole skeleton grows rapidly. The sponge is now in the Olynthus stage.

The above account, though necessarily brief, shows that our present knowledge does not render the morphology of sponges explicable, because, although we should certainly consider, if we knew the larvæ alone, the small flagellate cells to be strictly homologous in all the embryos, yet in one case these cells form the internal digestive cavity, in another the external skin. At present the meaning of this divergence is unknown.

The systematic position of the sponges has been much discussed. At one time they were considered protozoic colonies, which they certainly are not. German zoölogists usually connect them with the Cœlenterata, but inasmuch as the development is not in the least cœlenterate, and the structure of the adult sponge

is in nearly every respect peculiar, it seems to me best to accept Prof. Hyatt's view, and place sponges by themselves as a distinct sub-kingdom of animals, the *Porifera*.

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IV. Aphysinidæ, XXX, p. 379.
V. Die metamorphose von Sycandra raphanus, XXXI, p. 262.
VI. Spongelia, XXXII. p. 117.
VII. Spongidæ, XXXII, p. 593.
VIII. Hircinia und Oligoceras, n. g., XXXIII, p. 1.

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LIST OF THE BIRDS OF THE WILLAMETTE VALLEY, OREGON.

BY O. B. JOHNSON.

THIS is not meant to be a complete list of the avifauna of the region named, but only such a part as has fallen under my personal observation during a residence of over ten years at three different points, viz: Five years at East Portland, which is but six miles from the Columbia river; two years at Forest Grove, twenty-five miles west of Portland and at the foot of the Coast

mountains; and the rest of the time at Salem, on the Willamette river, and fifty miles south of Portland. The region referred to lies between the Cascade and Coast ranges, on an average of sixty miles apart, and from the Columbia on the north to the Callipoaia mountains on the south, a distance of about one hundred and thirty miles. To the north, and along each side, and on the streams, it is densely wooded, while on the middle and south is a chain of prairies of greater or less extent, giving great variety to the landscape. I have been necessarily brief, but with any one needing more explicit notes or material, I will gladly correspond.

1. *Turdus migratorius* Linn. (robin).—The robin is very common during the breeding season, nesting extensively, and not rare during the mild wet winter months, especially along the river bottoms.

2. *Turdus nævius* Gmel. (varied thrush), called "Cal. robin," "myrtle robin," "painted robin," and "Oregon robin."—More or less abundant during the winter months, arriving from the north and mountains about December 1st, and remaining until about June 1st. Usually shy and very thrush-like, they sometimes become quite tame about building, learning the habit from the common robin. I have always suspected that they nest in this State, about the bases of the snow-clad mountains, as hunters have told me that they have seen the bird at all times during the season in those places. They have no true song, but in its place they use the call note, which is a prolonged "*chur r-r*," followed after a short interval by a prolonged "*chee-e-e*" a "third" higher, and both in a minor key. The alarm note is a short decisive "*churk*." They feed upon the ground, scratching among dead leaves, usually in very moist situations. They also come to the gardens for cherries and small fruits.

3. *Turdus ustulatus* Nutt. (Oregon thrush). — Very common during the breeding season, nesting extensively and often raising two broods. The usual situation of the nest is in a dense thicket of low brush about four feet from the ground; it is composed of moss, very bulky and rather more attractive than otherwise, but I found one at the root of a maple tree upon a "burl" about four inches above the ground, two others were in a tree, about fifteen feet high, and composed entirely of twigs and brush well woven, and scantily lined with moss. The alarm note is a short whistle "*whoet*," identical with that of a person attracting the attention

of a dog, the call note is tremulous, "*whaat-r-r-r*," in the same key as the alarm note, only ending in a trill. Every evening and often on cloudy days, their song can be heard from every thicket; it is a peculiar whistle, ascending a scale of four notes, and sounds like "*holsey-govendy-govindy-goveendy*." They feed upon the ground.

4. *Sialia mexicana* Swains. (Western bluebird). — A common summer resident, breeding in deserted woodpecker's holes, knot-holes and crevices, especially delighting in favorable situations about buildings; they will for years return to the same place, even if roughly treated. Their only note is a mournful "*soenk*." They feed upon the ground, dropping upon their prey from an elevated position.

5. *Cinclus mexicanus* Swains. (water ouzel).—Found on all the dashing streams in the valley. I saw but one nest and that was shown me by the owner of a mill, and he said that a brood had been raised for four successive years in the same nest. It was placed between the ends of two projecting planks in the dam, and was an open nest, the upper plank rendering the dome part superfluous; it was of moss and the bark of the cedar from the logs in the vicinity. I suppose that they remain all winter, for I saw them in the Bitter Root mountains, in Idaho, when ice was forming on the streams and the snow two feet deep. The alarm note is a faint "*chip*," expressing interrogation rather than fear, and a song that is seldom heard, owing to the rushing and roaring surroundings; it comes as a faint lisping "*sweet-tweet tr-r-r-eet*," very prolonged, but rendered almost inaudible by its turbulent accompaniment. Their food, I suppose, is entirely aquatic, though I had one make an unsuccessful attempt at an artificial fly cast near it, showing that it knew a "tit-bit" as well as its scaly neighbor.

6. *Regulus satrapa* Licht. (golden-crowned kinglet).—Common throughout the winter in flocks, busily searching for insects among the dense second growth of *Abies douglassii*. Their note at this time is a very faint "*tseep*," answered quickly by the others. I have never seen the eggs or nest.

7. *Regulus calendula* Licht. (ruby-crowned kinglet).—Solitary individuals seen occasionally during the winter and spring among the thickets of rose and Spiræa. Never saw its nest or eggs.

8. *Parus occidentalis* Baird (western titmouse), called "chickadee."—Common throughout the year; breeding abundantly in

holes which they excavate in rotten wood, often in stumps not more than two feet from the ground; nest of hair and wool; eggs five, pure white, thickly speckled with light-brown, chiefly toward the large end. Its note is a loud, clear "*chick a dee-dee-dee*," given in a monotone.

9. *Parus rufescens* Towns. (chestnut-backed titmouse).—Less abundant than the last, which they closely resemble in habits. A nest that I found in the top of a willow "stub" (not excavated) contained four pure white eggs, somewhat larger than the preceding species, dotted sparingly with large patches of fawn-drab. The nest was lined with fur of a squirrel. Their note is a faint "*ke-dee-dee-dee*," the last syllable uttered a "fifth" higher.

10. *Psaltriparus minimus* Towns. (least titmouse).—Plentiful during the winter months among the evergreens, always in small flocks. Many remain all summer to breed, but they are more retired and less conspicuous. I took a nest of this species in June, 1874; it was pensile, built of moss (Hypnum and Tillandsia), with the entrance (a small round hole) on one side, passing up and over into the inside; it was lined with feathers and hair, and contained four pure white eggs. Their call note is a subdued "*zip*," "*zip*," varied to "*zip-kitty*."

11. *Sitta aculeata* Cass. (Western nuthatch).—Quite common during the summer and not rare during the winter. They breed in various places, the greatest desire being concealment. A pair had a nest in the college building at Forest Grove and raised seven young; the entrance was a knot-hole in the siding, and it was placed between the ceiling of the lower room and the floor above and was not accessible. Another was built for several years in the double roof of an ice-house upon the sawdust. I took out a set of nine eggs in 1877, white, specked with light brown of the same shade and pattern as *Parus occidentalis*, differing only in larger size. Their only note is a coarse harsh "*swank*," uttered at intervals that make one expect to see a larger bird.

12. *Sitta canadensis* Linn. (red-bellied nuthatch).—Associated with the preceding, which it much resembles in habits. Its call, "*beek*," is in a higher key and not so coarse. The nest and eggs I have not seen.

13. *Thryothurus spilurus* Vig. (Western mocking wren).—This bird is quite common in the swampy parts of the valley, and breeds, though I never saw its nest or eggs.

14. *Troglodytes parkmani* Aud. (Parkman's house wren).—Common during the summer and breeds plentifully, any place being "just right." I saw a nest in the pocket of a pair of trousers used as a "scare crow." In retaliation for their driving away a pair of blue-birds from a box at my house, I began taking the eggs, and succeeded in getting twenty-one, when I grew ashamed, and they afterwards laid and hatched five more. The song is like that of the Eastern species.

15. *Troglodytes hyemalis* Vieill. (winter wren).—Remains during the winter, living in semi-clearings under brush and log heaps, but leaves for other parts to breed.

16. *Anthus ludovicianus* Gmel. (titlark).—Common during winter, feeding in old fields and in roads.

17. *Helminthophaga celata* Say (orange-crowned warbler).—Very common during summer, and undoubtedly breeds, but I have never found its nest.

18. *Dendræca æstiva* Gmel. (summer warbler).—A very common summer resident, nesting extensively, with the usual habits of the species.

19. *Dendræca auduboni* Towns. (Audubon's warbler).—The most abundant warbler during summer, and a few remaining until far into, if not all, winter. It probably breeds commonly, but I have been able to find but one nest, taken May 26, 1879. It was placed in the top of a small oak *(Q. garryana)*, about fifteen feet from the ground, and placed between three upright twigs, built of grass and horsehair, and lined with feathers from a neighboring fowl-yard; it contained four greenish-white eggs, spotted around the larger end in a ring with light-brown and lavender, and a few dots of brownish black; they measured .72 by .54, .71 by .54, .70 by .52 and .70 by .52 of an inch.

20. *Dendræca coronata* Linn. (yellow-crowned warbler).—I have obtained several birds in spring that I have referred to this species.

21. *Dendræca nigrescens* Towns. (black-throated gray warbler. Moderately common during summer in favorable situations, seeming to prefer dense undergrowth near a swamp. I took a nest of this species June 17, 1879, in the top of a clump of Spiræa, built of fine roots and dried grass and lined with the down of the cottonwood It contained four eggs of a dirty-white color, thickly marbled with longitudinal lines and dots, more confluent

toward the larger end, of two shades of light-brown. They measured .66 by .53, .65 by .54, .65 by .54 and 65 by .52 of an inch.

22. *Geothlypis trichas* Linn. (Maryland yellow-throat).—A very common little resident during summer among the reeds and thickets about marshes, where they breed.

23. *Geothlypis macgillivrayi* Aud. (Macgillivray's warbler).—A summer resident, nesting quite commonly; it is usually placed in the very top of a rose thicket and hardly concealed; it is built of dried grass and leaves, and very loosely woven. Eggs usually four, pure white, sprinkled around the larger end with splashes and irregular dots of lilac, pale-brown and umber.

24. *Icteria longicauda* Lawr. (long-tailed chat).—Inhabits the dense thickets of Spiræa during the summer, and probably breeds, though I have not seen its nest.

25. *Myiodioctes pusillus* Wils. (green black-capped warbler).—Only noticed during the spring migrations.

26. *Hirundo lunifrons* Say (cliff swallow).—Abundant during summer, breeding chiefly under eaves.

27. *Hirundo bicolor* Vieill. (white-bellied swallow).—Also abundant, nesting in holes in trees.

28. *Hirundo thalassina* Swains. (violet-green swallow).—Also abundant, nesting in knot-holes and crevices about buildings; have never seen their nest in any other situation; among peculiar places, I saw one in a hollow east window sill, another under the tin top of a wooden capital, twelve feet above the sidewalk, another was under a sign that lay flatwise on the awning, another in an old hat that hung in a shed. They are decidedly the most familiar of the three species of swallows.

29. *Vireosylvia solitaria* Vieill. (blue-headed flycatcher).—A common summer resident, chiefly among deciduous trees, where it also nests. The nest is subpensile in a low horizontal fork, neatly and compactly built of fine grass and horsehair, lined with fine moss and spiders' webs, and externally covered with bits of Hepatica and Hypnum to resemble a piece of bark. The eggs, usually four, pinkish-white, covered at the large end with reddish-brown dots and marks. The song is irregular, "*to whit-to whee—to whit-to wheo*," repeated incessantly as they flit among the leaves for food, their favorite tree being the large oak *(Q. garryana)*.

30. *Ampelis garrulus* Linn. (waxwing).—I obtained a pair of

these beautiful birds during a snowstorm in January, 1876, at Forest Grove. They were feeding at the time on rose berries.

31. *Ampelis cedrorum* Vieill. (cedar bird).—An abundant summer resident, nesting extensively in the groves of small Douglass spruce.

32. *Collurio borealis* Vieill. (Northern shrike).—Quite common resident, though I have not found it breeding.

33. *Pyranga ludoviciana* Wils. (Louisiana tanager).—Another one of those common summer residents that seem to defy all attempts at the discovery of its nest.

34. *Curvirostra americana* Wils. (red crossbill). Common among the evergreen covered mountains, and coming down to the valley in winter. I have not seen its nest.

35. *Carpodacus californicus* Baird (Western purple finch).—Common summer resident, and breeds, though I have not yet found a nest. It is noted for its habit of cutting off the bloom of the cherries for the embryonic seed therein. Its note of alarm is a "*quit—quit*," and its song a warbling "*whidly-whidly-whidly*," repeated very rapidly.

36. *Chrysomitris tristis* Linn. (yellow bird). A common summer resident, breeding extensively, with the usual habits of the species.

37. *Chrysomitris pinus* Wils. (pine finch).—A common winter resident, living in flocks, and frequenting fields and gardens for seeds, virtually taking the place of the preceding at that time. It probably breeds in the mountains.

38. *Hesperiphona vespertina* Coop. (evening grosbeak).—Sometimes plentiful during the spring migrations, frequenting the maple (*A. macrophyllum*), the seeds of which are a favorite food. The only note I observed was a loud "*yeeip*," strikingly like the call of a lost chicken.

39. *Passerculus sandwichensis* Gmel. (Alaskan sparrow).—Seen sparingly during the migration, which is usually in small flocks.

[*To be continued.*]

A BOTANIST IN SOUTHERN CALIFORNIA.

BY JOSEPH F. JAMES.

HE who would see California at her best, should come here in the spring. If the traveler arrives about the middle of March, he will find the spring in all its beauty and freshness. After his passage over the snowy Sierra, he will be delighted at the change from ice and snow to green grass and flowers; from cold and cutting northern winds to gentle balmy southern breezes. The sky will appear of a brighter blue, and the grass of a greener tinge than he ever saw before, and he will feel a vigor and a freshness which he has not felt in many a long day. There seems to be a something in the air of California which makes it different from what it is elsewhere. It may be that it is possessed of more ozone than common, and the presence of that material freshens up one's thoughts and feelings. The rains of the winter season will then be over, and the grass and flowers will be seen in all their verdure and freshness. On the other hand, should he arrive in the summer, he will find everything dried and parched; and as first impressions are always the most lasting, it is likely that he will have a much poorer opinion of the country than if he had seen it first in all its beauty.

To a botanist, California is almost a paradise, and although he will not find in it much of that magnificent vegetation, and those grand and interminable forests which are characteristic of the tropics, we venture to say that he will find here as many, or nearly as many, curious and interesting forms of vegetable life as he can find in any other country of the world. The distribution of rain during the year has been the cause, at least in Southern California, of a peculiarity in the development of vegetable life. Rain falls only from November to March, and the remainder of the year is dry and hot. By the middle of June or July many of the plants and flowers have disappeared; the grass is dry and parched, and the whole country assumes an appearance which is extremely depressing. Most all the flowering plants appear, therefore, in the spring, and it is almost next to useless to hunt for them, except along the banks of streams and in deep shaded cañons, after the first of June.

But the spring! Ah! that is the time. It would be almost impossible to find a more beautiful sight than is then visible in

the vicinity of Los Angeles, the metropolis of Southern California. Then the plains surrounding that city, the hills and the valleys are one mass of gorgeous brilliant flowers. They are there by thousands upon thousands, and of almost endless variety. We shall attempt to enumerate some of them, and give a general idea of the appearance of the country in its season of beauty.

Most conspicuous of all, both for its abundance and its color, is the California poppy *(Eschscholtzia californica* Cham.*)*. Never have I seen such a brilliant mass of color as was presented by this plant last spring. It covered acres of ground, and the bright golden yellow or orange of its flowers, conspicuous among the mass of other verdure, was visible for miles. I have one patch in my mind now which, seen on a bright clear day, was, with the sun shining full upon it, too dazzling for the eye to gaze upon. Truly it was the " Field of the Cloth of Gold." In places where the ground had been plowed, paths of it had been left, and they seemed like tongues of fire running over the ground.

Two species of Alfillerilla, or pin clover *(Erodium cicutarium* L'Heer and *E. moschatum* L'Heer), are very common. These are very valuable as forage plants, and without them it is hard to tell what the country would do. Both species are very similar, one having the leaves more finely dissected than the other. The flowers are small and of a bright purple. The seeds are peculiar. After the petals have fallen the pedicels become deflexed, but the seeds still stand upright. They are five in number, united to a stylus, and each one is furnished with an awn an inch or so in length, with hairs at the base. When the seeds ripen and dry, they split the capsule at the base, and each one begins to twist on its own account; when they get through, the awns of all are closely twisted together, and the seeds stick out on all sides. If one seed is separated from the others before it is fully ripe, and examined, the awn will be seen to twist. It drys very rapidly, and in the contraction turns the seed round and round till a close coil about half its length is formed, and this coil sticks out at right angles from the seed. On wetting the awns again, they will untwist and become as straight as before. This seems to me to be a provision of nature for forcing the seed into the ground. Be that as it may, the seed itself is very hard and sharp pointed, and has a faculty of sticking very close to anything it gets into.

The *Sidalcea malvæflora* Gray, is one of the prettiest and com-

monest of the plants of the plains. It grows from one to two feet high, and has the large purple flowers interruptedly ranged on the stem, with the round cordate and crenate leaves at the base. *Platystemon californicus* Benth., known as cream cups, is very common. The flowers are white or cream colored, and are raised on naked hairy peduncles four to six inches long, looking something like an Anemone. *Dodecatheon meadia* L. (var ?), the shooting star, common in the East, is occasionally seen, and with its pretty and curiously shaped flowers reminds one of the rocky banks and shady ravines where it finds its Eastern home. Several species of Orthocarpus, with small curious purple flowers, are common; one species (*O. purpurascens* Benth.) is small and inconspicuous in itself, but it grows in dense masses, covering the ground for miles, and giving it a purplish hue. The *Bæria gracilis* Gray, a small composite plant with bright yellow flowers, is so common as to cover acres of ground and add its quota to the general glory. *Sayia platyglossa* Gray, is also common; its yellow flowers tipped with cream color. Occasionally a patch of *Pæonia brownii* Dougl., greets the eye with its large dark purple or reddish flowers, and heavy thick bright-green leaves. The poor man's weather glass, or pimpernell (*Anagallis arvensis* L.), with its bright pinkish flowers, is common in cultivated grounds. *Collinsia bicolor* Benth. with bright purple flowers, hides itself modestly under greasewood bushes and sage brush. *Castilleia passiflora* Bong., with its flaming scarlet flowers, looks, in the distance, like the *Lobelia cardinalis*, that beauty of the swamps and meadows of the East. *Penstemon cordifolius* Benth., and *P. centranthifolius* Benth., adorn the banks of streams with their scarlet flowers. In shady places the tall green *Scrophularia californica* Cham., similar to *S. nodosa* L., towers far above the low but pretty *Claytonia perfoliata* Donn., with its raceme of white flowers. This last delights in damp shady places, and in such localities it is very common. *Salvia carduacea* Benth., is common in dry sandy soil, as is also *S. columbariæ* Benth., with its cluster of blue flowers. The *Amsinckia spectabilis* Fisch and Meyer, a small inconspicuous plant with yellow flowers, is so common as to cover acres of ground. Two species of Phacelia (*P. ramossisima* Dougl. and *P. tanacetifolia* Benth.), with white and blue flowers, are common, while their near relative, *Nemophila aurita* Lindl., with pretty blue flowers, and weak in the stem, helps to raise

itself above the ground by climbing with its prickly stem up other plants. *N. insignis* Dougl., also with blue flowers, is very pretty and common, and is one of the earliest spring flowers.

The species of Gilia are very numerous, and many of them have such differently shaped flowers, and such varied habits of growth that a novice would never place them in the same genus. There is the *G. californica* Benth., which has large funnel-shaped purple flowers, and leaves awl-shaped and bristle-like, and grows into quite large bushes. As an opposite is the *G. intertexta* Steud., a dwarf form of which has small white flowers, and forms a mat spread out close on the ground. Then the *G. multicaulis* Benth., with its short upright stem, and small bunch of purplish flowers is very different from the *G. densifolia* Benth., with a white wooly stem, linear pointed leaves and large bright blue flowers in dense clusters.

The *Convolvulus occidentalis* Gray, with its large white flowers, twines over the ground and bushes. Though the Liliaceæ are not numerous in species, there is one, *Calochorus splendens*, which is very handsome. The flower is quite large, of a purple-blue color, raised on a long slender stem, and as it waves to and fro in the air, it well merits its name of "splendens." *Datura meteloides* D.C., common on the roadsides, quite puts to shame its relative the "Jamestown" weed, of the East. It has large white flowers, six and eight inches long, and forms a bush two or three feet high. It possesses none of that vile odor peculiar to the "Jamestown," but has rather an agreeable smell. *Mirabilis californica*, one of the Nyctaginaceæ, is common all over the hills, and has viscid, sticky leaves and stem, and bright purple salver-shaped flowers. *Euphorbia albomarginata* forms large mats on the ground, one plant sometimes covering very closely a space two feet in diameter. *Sisyrinchium bellum* takes the place of the Eastern *S. bermudiana*, which it very much resembles.

One of the handsomest plants I have ever seen anywhere, is the *Yucca whipplei* Torr., commonly known as the Spanish bayonet, and it is quite common around Los Angeles. Never shall I forget the sensation I felt the first time I saw this beautiful plant. We were riding up a cañon, near San Juan Capistrano, toward the warm sulphur springs, when off to our right appeared a tall mass of white. What it was we could not tell, but riding toward it, we soon had it revealed to us in all its beauty and

majesty. Imagine a stalk ten or fifteen feet in height, two inches in diameter at the base, branched like a candelabra and covered for six or eight feet of its height with a mass of cream-colored, bell-shaped, drooping flowers. At the base the long, sharp, serrated leaves stuck out on all sides, as if to guard against the approach of any injurious animal. When seen standing along the mountain side, its white mass of blossoms outlined against the dark background of the naked rock, it looks like a sentinel keeping guard over the valley; and numbers of them ranged one after another, and one above another, looked like a troop of soldiers placed there to stand guard. They grow in such steep and inaccessible places oftentimes that it is impossible to get at them. As it gets old the leaves become frayed at the edges, and the fibers hang like long filaments down each side of the leaf.

Ranunculus californicus Benth., is very common in wet and damp places, and *R. cymbalaria* Pursh., grows in great profusion in the sand on the bank of the Los Angeles river. *Viola pedunculata* Torr. and Gray, with its pretty yellow and black flowers, is conspicuous amid the flowers of the plains, and *Nasturtium officinale* R. Br., almost blocks up the water of slow-flowing and shallow streams. It grows in shady places, sometimes three feet high, and in such dense masses as to make it difficult to force one's way through it. *Vitis californica* Benth., the only representative of the Vitaceæ in California in a wild state, is common, and climbs high over the willow hedges and bushes in damp localities. The deadly *Rhus diversiloba* Torr. and Gray, own cousin to *Rhus toxicodendron* L. of the East, is too common all over the plains, hills and cañons of Southern California, and while some persons can handle it with impunity, others barely touching it are afflicted with a severe cutaneous eruption. *Tellina cymbalaria* Gray, is a very pretty little plant with radical leaves and a cluster of white flowers on the end of a long scape. It grows in damp shady places, and is very common.

There are several genera which are very common all over California, and many of the species resemble each other so closely as to be nearly undistinguishable. Among the Leguminosæ, for instance, the genera Lupinus, Hosackia and Astragalus are all large. The species of the last are very numerous, and so closely connected as to cause great trouble in separating them. Nearly all the species have white or yellow flowers, pinnate leaves and

bladdery pods. The rattle weed is one of them, and is so named because the dry pods swept over the ground by the wind make a noise like the rattlesnake's warning. Another is the Loco plant, a terror to owners of horses and cattle. It is said that when eaten by animals it acts like a slow poison. A horse, for instance, seems to be affected in the brain; he becomes stupid, easily frightened at any little object coming suddenly before him, is inclined to run away, and often goes mad, insane, and to wind up all, dies from its effects. A locoed horse can easily be detected by the dull stupid look in his eyes. Among the lupines there are some of our most gorgeous flowers. The shrubby species often grow four and five feet in height. The *L. rivularis* Dougl., has large bright green leaves and spikes of bright blue flowers, often two feet in length. As an antithesis to this there is the *L. micranthus* Dougl., which is from four to eight inches high and has small white or blueish flowers. The *Hosackias* are sometimes bushes four to six feet high, and sometimes lie flat on the ground, the stems of a single plant being three to five feet long. The flowers are generally yellow, and the leaves small and three-parted.

Along all the roads, and covering the ground otherwise devoid of vegetation, we see the mock orange (*Cucurbita perennis* Gray); the flowers are quite large and yellow, leaves very rough and scabrous, and the fruit hard, round and yellow, looking like an orange. The root extends into the ground three or four feet and is sometimes as big round as a man's body. The *Megarrhiza californica* Torr., another species of the Cucurbitaceæ, twines over the rocks and bushes in a luxuriant manner; it has long tendrils which are slightly sensitive; when rubbed on one side, they soon bend toward that side and twine round any support they may happen to touch. Along in July the *Clematis ligusticifolia* Nutt., with its panicles of white flowers or carpels with long silky tails, climbs over shrubs and into trees along the water courses. *Brassica nigra* Boiss, the common mustard, is one of the most pernicious weeds of the whole of Southern California, and it covers the ground in many places for acres, to the entire exclusion of other plants. Sometimes it is eight and ten feet in height and two or three inches in diameter at the base. I have ridden through fields of it early in the spring when it was as high as the saddle on the horse. *Malva borealis* Wallman, is another very troublesome weed, and grows everywhere round houses and

in waste ground; in old sheep and cattle corrals it is especially luxuriant, and grows sometimes so thick and strong that even a horse has difficulty in forcing his way through it. It closely resembles *M. rotundifolia* L.

Several genera of Onagraceæ are abundant in species and specimens, Œnothœra and Godetia being the most abundant. A small plant belonging to this order, *Clarkia elegans* Dougl., is found in shady cañons, and is remarkable for its queer-shaped, handsome, purple flowers, and is often cultivated. The *Zauschneria californica* Presl., has bright red flowers, and adorns dry banks and hills in the summer. *Isomeris arborea* Nutt., one of the Capparidaceæ, is a small shrub with yellow flowers and inflated pods, and is very common near San Diego, flowering in November. A species of Hydrocotyle is very common in slow-flowing streams, and its circular crenated leaves seem to float on the water, and amongst them are thousands of specimens of *Azolla americana*, covering the surface of the water with its green mantle for considerable spaces.

I have confined my attention in this article almost entirely to the herbs and shrubs, and have by no means exhausted the list of them. Species are very numerous in Southern California, and I may, another time, have something to say in regard to the trees and larger vegetation generally of the country.

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PROGRESS OF AMERICAN CARCINOLOGY IN 1879.

BY J. S. KINGSLEY.

AMERICAN science, when compared with that of Europe, does not present a very creditable appearance. In the physical sciences almost every country of the old world is far ahead of the United States. With geology it is about the same, while in biology, American work, with a few conspicuous exceptions, has not surpassed a low state of mediocrity. The pages of the numerous scientific journals are filled with descriptions of new species, faunal lists and even worse nonsense, while anatomical and embryological papers are few and far between, and even then the majority of them are fragmentary and abound in errors of observation. In the philosophy of biology, America has done almost nothing. It is not the place in an article of this series, to insti-

tute an inquiry as to the reasons for this low condition of science. There is an institution in this country known as "The American Association for the Advancement of Science," surely a high sounding title; but would it not be well for the Association to begin to carry out its object? to do something for the advancement of science? Judging from the character of the papers published in its somewhat voluminous proceedings, it acts as a drag rather than an aid to progress. I might here add that aside from its grants of money to the Zoölogical and Geological Records, and to specialists to enable them to carry out certain lines of investigation, its British prototype is no more worthy of its pretentious name.

The American carcinological literature of 1879, may be considered under three heads, systematic, anatomical and developmental. Systematic papers have been published during the past year by Dr. Walter Faxon, Messrs. Oscar Harger, C. L. Herrick and J. S. Kingsley, Prof. A. S. Packard, Jr., Mr. John A. Ryder and Prof. S. I. Smith. Mr. Faxon gives an account of a species of *Lucifer*,[1] provisionally referred to the species *typus* of Milne Edwards. Mr. Ryder describes as new *Chirocephalus holmanii*[2] and *Streptocephalus scalii*,[3] from New Jersey. Having seen specimens of the former species, I can say that it is not a species of *Streptocephalus*, as Dr. Packard seems to suspect,[4] but truly belongs to the genus *Chirocephalus*, where Mr. Ryder placed it. Dr. Packard has recently[5] proposed a new order, *Phyllocarida*, to receive *Nebalia* and its fossil allies; and in his recently issued Zoölogy[6] has given a new classification of the Crustacea, which was repeated in outline in the December NATURALIST.

The work of Harger on the Isopoda of New England, Herrick on the Minnesota Entomostraca, and Smith on the New England Decapoda, have been already noticed in the NATURALIST, and hence need not be referred to again. Mr. Kingsley has contributed several short notes and reviews in the various numbers

[1] Description of *Lucifer typus* M. Edw.? Chesapeake Zoölogical Laboratory; Scientific results of the Session of 1878, pp. 113–119, Pl. VII, 1879.

[2] Description of a new species of Chirocephalus. Proc. Academy of Nat. Sci., Philadelphia, 1879, pp. 148–149.

[3] Description of a new Branchipod, l. c., 1879, pp. 200–202.

[4] AMERICAN NATURALIST, XIV, p. 53 (1880).

[5] AMERICAN NATURALIST, XIII, 128, and *Annals and Mag. Nat. His.*, III, 459.

[6] Zoölogy for Students and General Readers, N. Y., 1879.

of this journal, while in his paper on Decapoda,[1] he describes as new, eight species, *Microphrys error* and *Callinectes dubia* from the west coast of America, and *Mithraculus hirsutipes*, *Mithrax trispinosus*, *Lambrus granulatus*, *Panopeus packardii*, *Pilumnus dasypodus* and *P. melanacanthus* from Florida. Notes are given on *Anaptychus cornutus*, *Mithraculus areolatus*, *Mithrax triangulatus*, *Panopeus affinis*, *P. purpureus*, *Xantho 9-dentatus*, *Chlorodius fisheri*, *Pachygrapsus transversus*, *P. gracilis* and *Calappa convexa*.

In anatomy almost no work has been done. Dr. Packard in his Zoölogy, gives a résumé of the structure of the Crustacea, but the additions to our knowledge of these animals is slight. A figure is given showing the differences between the eyes and brain of the blind craw-fish *(Cambarus pellucidus)* and another species with well developed eyes. A brief account of the visceral anatomy of *Serolis* is given, to which we must take exception, it being erroneous in several particulars. The writer contributed to the same work, figures of the nervous anatomy of *Idotea irrorata* and of *Serolis*, but they show no important differences from similar figures of other species of Isopoda.

It is in embryology that the valuable portion of American work on the crabs has been done, and here we have to record three papers on the development of these animals; two by Dr. Faxon and one by Dr. W. K. Brooks. Dr. Faxon in his first paper[2] gives figures showing the later egg-stages and the first stage after hatching of *Hippa talpoida*, so that with the previous paper of Prof. Smith on the same subject,[3] we have a nearly complete life history of this species. In the first egg stage observed, the labrum, both pairs of antennæ, the mandibles and the telson are outlined (the "nauplius" stage). Both pairs of maxillæ and the first two pairs of maxillipeds appear previous to hatching, and in the first zoea stage no other appendages are indicated, but those mentioned acquire a greater development. The abdomen consists of four joints without appendages and the telson resembles somewhat strongly that of a larval shrimp. The gills are yet lacking, and although able to see the other vessels distinctly, our author could not discover the hepatic artery. Dr. Faxon

[1] Notes on North American Decapods. Proc. Boston Soc. Nat. Hist., xx, pp. 145–160, 1879.

[2] On some young stages in the development of *Hippa*, *Porcellana* and *Pinnixa* Bulletin of the Museum of Comp. Zoölogy, v, pp. 253–268, pls. I–v (June, 1879).

[3] Transactions of the Connecticut Academy, III, pp. 311–342, pls. 45–48 (1877).

next discusses the growth of *Polyonyx macrocheles*. The last stages of the zoea obtained at Newport showed the enormously elongate spines of the carapax characteristic of the young of the porcelain crabs. All of the cephalothoracic appendages were present, the first two pairs of maxillipeds being large, biramose (schizopodal) and adapted for swimming. The third maxillipeds were rudimentary, and the ambulatory feet curled under the carapax. Six gills were noticed. The abdomen had six joints, and in the telson of those about to moult could be seen outlined the lacking segment with its appendages. From this stage the crab emerged at a moult without the intervention of a megalops stage. The young crab is nearly orbicular, and has not that "breadth of beam" characteristic of the adult, but resembles rather the genus *Pisosoma* of Stimpson. A bibliography of the embryology of the Porcellanidæ is given, but we notice that the figures of Guerin (in Ramon de la Sagra's Historia fisica, etc., de l'Ile de Cuba, Paris, 1857) are not mentioned. The last species in the present paper is *Pinnixa chætopterana*, which in the last zoeal stage has four long spines, one rostral, one dorsal and one from each postero-lateral angle of the carapax, arranged much as in the oft-copied figures of the zoea of *Carcinus mœnas*. The cephalothoracic appendages have acquired a more or less complete development, the last six, however, being concealed much as in *Polyonyx*. From this stage the crab develops directly, the young, however, not having the enlarged fourth pair of feet which characterize the genus, though the family characters are recognizable. In a supplementary note it is stated, on the authority of Prof. Smith, that a second species of *Pinnixa* found on the New England coast passes through a megalops stage.

The same author has worked out more completely the development of the common prawn of our coast,[1] and his paper forms a marked exception to the general poor quality of American biological work. In this species the cleavage of the yolk occurs in two planes almost synchronously, producing four cleavage spheres, from which the segmentation progresses regularly until the morula stage is reached. No polar vesicles were observed. The gastrula condition was discovered within twenty-four hours, but concerning the origin of the hypoblast we are told nothing.

[1] On the Development of *Palæmonetes vulgaris*. Bulletin Mus. Com. Zoöl., v, pp. 303–330, pls. I–IV (Sept., 1879).

The gastrula mouth soon closed. The first parts of the embryo to appear are the labrum, two pairs of antennæ, the mandibles and the abdomen, the latter very near the former position of the gastrula mouth. These parts appear almost simultaneously. Four days later both pairs of maxillæ and the first pair of maxillipeds have budded; in seven, the two remaining pairs of maxillipeds have appeared, all appendages showing a biramose character. The growth goes regularly on, the yolk being gradually absorbed, the eyes appearing at first as patches of dark pigment,[1] and when the prawn hatches there is a small simple eye at the base of the rostrum, the eyes proper are supported on short pedicels, the antennulæ are simple, the antennæ biramose, the future scale being much larger than the flagellum, the mandibles at no stage possess palpi. The scaphognathite (gill bailer) is in constant motion, though no gills are yet present. The three pairs of maxillipeds are two-branched, and their basal joints act as jaws, reminding one, as Dr. Faxon says, of the manducatory apparatus of *Limulus*. The ambulatory feet are represented by only two pairs of double sacks, the other three being undeveloped. The abdomen is six-jointed and without a trace of appendages. A moult brings two more ambulatory feet, and with the next exuviation the second antennal flagellum appears and the abdomen has seven joints, the sixth with its appendages appearing. After another moult two of the basal rostral teeth appear, the third pair of ambulatory feet acquire a natatory character, and the fourth and fifth pairs as well as the abdominal feet have budded. With two more moults the animal has acquired all its swimming feet, but differs from the Schizopoda (*Mysis*) in having the last pair simple, the exopodite being absent. In two or three more exuviations the exopodites are reduced to simple styles, and after a few more, the shrimp, then about eight millimetres long, acquires essentially the characters of the adult. Rostral teeth, however, continue to be added with growth.

Succeeding this account, summarized above, Dr. Faxon gives a critical review of the literature of the development of *Palæmon*, and we think him right in disagreement with Mr. Spence Bate regarding the homologies of the three pairs of appendages which appear first in the Crustacean embryo.

[1] I would here quote the foot-note on p. 308: "The development of the eye certainly lends no countenance to the idea that its stalk is an appendage homologous with the antennæ, etc."

The development of *Squilla*, by Dr. W. K. Brooks,[1] concludes our notice of the literature of American Crustacea for 1879. While the successive stages in the development of *Palæmonetes* were in most cases the result of the moulting of the larvæ in confinement, Dr. Brooks had to depend more upon the results of surface skimming for his younger stages, and hence his paper, though of great value, lacks the completeness of the last noticed one of Dr. Faxon. The first stage observed was that which formed the genus *Alima* of the earlier systematists; the eyes, both pairs of antennæ, mandibles, maxillæ and first two pairs of maxillipeds being present, the second pair possessing something of the raptorial character found in the adult. The eighth to tenth segments (9–11 Brooks) are differentiated, the eleventh to thirteenth (12–14 Brooks) are still united and all are without appendages. The abdomen consists of six joints, of which four bear appendages; the carapax with its long spines resembles somewhat that of the Decapod zoea. In the next stage the thoracic segments are all free. The third stage observed represents the changes of at least two moults, the remaining thoracic and fifth abdominal appendages being represented by small buds. The next form figured has the carapax and telson somewhat like those of the adult, while the appendages are all present, those of the abdomen, judging by the figures, having assumed something of their adult branchial character.

I would here return thanks to the various authors mentioned for copies of their papers.

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THE STRUCTURE OF THE EYE OF TRILOBITES.

BY A. S. PACKARD, JR.

BEYOND the fact that the entire eye of certain Trilobites, and enlarged views of the outer surface of the cornea of the eye, have been described and figured in Burmeister's work on the organization of Trilobites and in various palæontological treatises in Europe and North America, especially by Barrande in his great work on Trilobites, I am not aware that any one has given a description of the internal structure of the hard parts of the eye of Trilobites.

[1] Larval stages of *Squilla empusa*. Chesapeake Zoölogical Laboratory. Scientific Results of the Session of 1878, pp. 143–170, pls. 9–13 (1879).

The full bibliography of treatises relating to these animals in Bronn's Die Classen und Ordnungen des Thierreichs, carried up to 1879 by Gerstacker, contains references to no special paper on this subject, and the résumé by Gerstacker of what is known of the structure of the eye, only refers to the external anatomy of the cornea, the form of the facets and their number in different forms of Trilobites. He shows that observers divide them into simple and compound; the former (ocelli) are found in the genus *Harpes*. These "ocelli" are said to be situated near one another, and are so large that the group formed by them can be seen with the unaided eye; the surface of the single "ocellus" appears, under the glass, smooth and shining. From the description and the figure of the eye enlarged, from Barrande, it would seem as if each eye was composed of three large simple ones; so that these eyes are really aggregate, and not comparable with the simple eye or ocellus of Limulus and the fossil Merostomata.[1] Moreover the situation of these so-called ocelli is the same as that of the compound eyes of other Trilobites.

The Trilobites with compound eyes are divided into two numerically very dissimilar groups; the first comprising Phacops and Dalmanites alone, and the second embracing all the remaining Trilobites, excepting of course the eyeless genera, Agnostus, Dindymene, Ampyx and Dionide. The eyes of Phacops and Dalmanites are said by Quendstedt and Barrande not to be *compound* eyes in the truest sense, but *aggregated* eyes (*Oculi congregati*). But judging by Barrande's figures of the eyes of *Phacops fecundus* and *P. modestus* (Barrande, Vol. 1, Suppl. Pl. 13, Figs. 12 and 22), and our observations on the exterior of the eye of an undetermined species of *Phacops*, kindly sent us by Mr. J. F. Whiteaves, Palæontologist of the Canadian Geological Survey, we do not see any essential difference between the form and arrangement of the corneal lenses of Phacops and Asaphus, and are disposed to believe that the distinctions pointed out by the above named authors are artificial.

For my material I am mainly indebted to Mr. C. D. Walcott, who has so satisfactorily demonstrated the presence in Trilobites of jointed cephalo-thoracic appendages. On applying to him for specimens, and informing him that I wished to have sections

[1] The eyes of the fossil Merostomata (Eurypterus and Pterygotus) are evidently in external form and position, judging by Mr. Woodward's figure, exactly homologous with the ocelli and compound eyes of Limulus.

made of the eyes of Trilobites to compare with those of Limulus, he very generously sent me his own collection of sections of the eyes of *Asaphus gigas* and *Bathyurus longistrinosus*, which he had prepared for his own study, also other eyes, and especially the shell or carapace of a large Asaphus, from Trenton Falls, showing the eye and the projecting points of the corneal lenses. Prof. Samuel Calvin kindly sent me the eyes of an unknown Trilobite from the Trenton limestone, one specimen showing the pits made in the mud by the projecting ends of the corneal lenses, while to Mr. Whiteaves I am indebted for a well preserved eye of Phacops. To Dr. C. A. White, Palæontologist of the U. S. Geological Survey, I am also indebted for eyes of Calymene.

First turning our attention to the casts and natural sections; that of the interior of the carapace, including the molted cornea of *Asaphus gigas*, is noteworthy. When the concave or interior

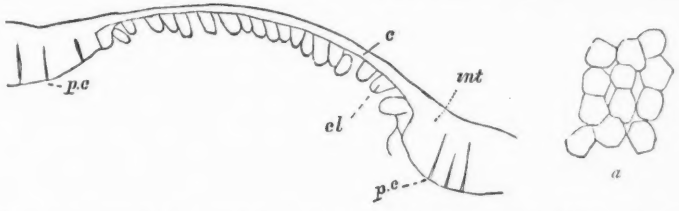

FIG. 1.—Section of hard parts of eye of Limulus; *c*, cornea; *int*, integument; *pc*, pore canals; *cl*, corneal lens. × 30 diams. FIG. 1*a*, optical section of facets.

surface of this specimen is placed under a magnifying power of fifty diameters, the entire surface is seen to be rough with the ends of the minute solid conical corneal lenses which project into the body-cavity. This is exactly comparable with the cast shell of Limulus and its solid corneal lenses projecting into the body cavity (Fig. 1). Those of Asaphus only differ in being much smaller and more numerous, and perhaps rather more blunt. Without much doubt the ends of the corneal lenses of Asaphus, as in Limulus, were enveloped in the retina, the animal molting its carapace, the hypodermis with the retina being retained by the trilobite, while the corneal lenses were cast with the shell.

In the specimen of the unknown trilobite from Iowa, received from Prof. Calvin, the corneal lenses, seen externally, are quite far apart, arranged in quincunx order; the lenses are round and decidedly convex on the external surface. In a natural section, where the

eye has been broken into two, the conical lenses are seen to extend through the cornea as cup-shaped or conical bodies, and are quite distinct from the cornea itself. In another broken eye of the same species, the cornea is partly preserved, and two of the corneal lenses are seen to extend down into and partially fill two hollows or pits; these pits are evidently the impressions made in the fine sediment which filled the interior of the molted eye or cornea!

Thus in the *Asaphus gigas* noticed above, we have the entire inside of the cornea with the cone-like lenses projecting from the concave interior; while in the last example we have the impressions made by the cones in the Silurian mud which silted into the cornea after the trilobite had cast its shell.

Farther evidence that the trilobite's eye was constructed on the same pattern as that of the living horse-shoe crab is seen in the sections made by Mr. Walcott. We will first describe, briefly, the eye of Limulus. Fig. 1 represents a section through the cornea of Limulus; *c*, the cornea, which is seen to be a thinned portion of the integument; *pc*, indicates one of the nutrient or pore canals, which are filled with connective tissue extending into the integument from the body cavity; *cl*, is one of the series of solid conical corneal lenses. These are buried partly in the black retina, and the long slender optic nerve just before reaching the eye subdivides, sending a branch to each facet or cornea, impinging on the lens. Fig. 1*a* represents a vertical view of the corneal lenses or facets, magnified fifty diameters, as seen through the transparent cornea. It will be seen that they are slightly hexagonal and arranged in quincunx order; their external surface is flat, though that of the ocelli is slightly convex.

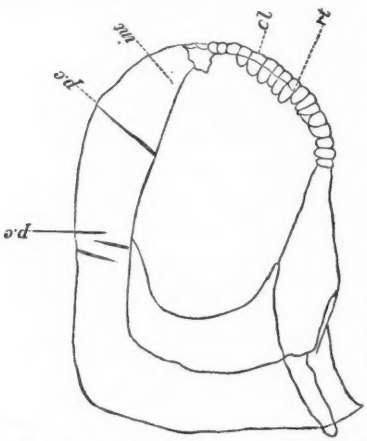

FIG. 2.—Section through the eye of a trilobite; lettering as in Fig. 1. × 50 diams.

Now if we compare with the horse-shoe crab's eye that of the

trilobite *(Asaphus gigas*, Fig. 2), we see that the eye is raised upon a tubercle-like elevation of the carapace; the integument *(int)* is about as thick as that of Limulus, and it contains similar pore-canals *(pc)*; the eye itself, or cornea, occupies a rather small area; its exterior surface, instead of being smooth as in Limulus, is tuberculated, or divided up into minute convex areas; these convexities are the external surfaces of the corneal lenses, which extend through the cornea, so that its surface is rough instead of smooth as in Limulus; *cl* indicates one of the corneal lenses which are arranged side by side; they are of slightly different lengths and thicknesses, and the rather blunt free ends project into the cavity of the eye, which in the fossil is filled with a translucent calcite.

It is quite apparent that we have here the closest possible homology between the hard parts of the eye of Limulus and the Asaphus. Another point of very considerable interest is a tolerably distinct dark line *(rt)* which seems to run across from one lens to another, and which may possibly represent the external limits of the retina or pigment mass in which the ends of the lenses were probably immersed; should this be found to be the indications of the outer edge of the retina, it would be a most interesting fact in favor of our view of the identity between the eyes of the two types of *Palæocarida* under consideration.

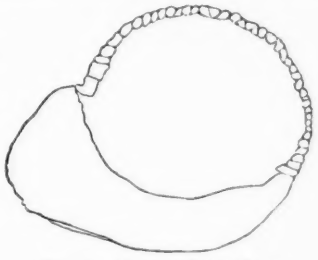

FIG. 3.—Cornea of Asaphus.

Another section sent us by Mr. Walcott is represented by Fig. 3; it is from *Asaphus gigas*, but represents a less elevated and broader part of the eye than that seen in Fig. 3; the section does not so well exhibit the free ends of the corneal lenses. Fig. 3 *a* represents a transverse view of the eye of *Asaphus gigas*, showing the hexagonal form of the facets, and their quincunx arrangement.

FIG. 3*a*.

This hexagonal appearance of the corneal lenses is still retained in natural vertical sections of eyes of the same genus; where with a good Tolles lens the sides of the cones are seen to be angular. Fig. 4 represents a few such cones. I do not understand to what this hexagonal appearance is due; for both in

Limulus and the Trilobites the corneal lenses appear usually to be round, and yet in making a camera drawing (as are all those here represented) of the cornea of Limulus from above, they present the same hexagonal appearance as in the Trilobites. The cause of this I leave to others to explain.

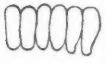

FIG. 4. — Lenses of Asaphus.

In a section (transverse) of the cornea of *Bathyurus longistrinosus*, received from Mr. Walcott, the lenses are seen to be very irregular, five or six-sided, and very irregularly grouped, not arranged in distinct rows.

From the facts here presented it would seem evident that the hard parts of the eye of the Trilobites and of Limulus are, throughout, identical. The nature of the soft parts will, as a matter of course, always remain problematical; unless the dark line indicated in Fig. 3 *(cl)* really represents the outer edge of the pigment of the retina; but however this may be, judging by the identity in structure of the solid parts, we have, reasoning by analogy, good evidence that most probably the eye of the Trilobites had a retinal mass like that of Limulus, and that the numerous small branches of the long slender optic nerve (for such it must have been) impinged on the ends of the corneal lenses. It has been shown by Grenacher and myself that the eye of Limulus is constructed on a totally different plan from that of other Arthropods; I now feel authorized in claiming that the trilobite's eye was organized on the same plan as that of Limulus; and thus when we add the close resemblance in the larval forms, in the general anatomy of the body-segments, and the fact demonstrated by Mr. Walcott that the Trilobites had jointed round limbs (and probably membranous ones), we are led to believe that the two groups of Merostomata and Trilobites are subdivisions or orders of one and the same sub-class of Crustacea, for which we have previously proposed the term *Palæocarida*.

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RECENT LITERATURE.

THE GEOLOGY OF WISCONSIN.[1]—This bulky report has not only a handsome typographical appearance, but is well illustrated by numerous excellent plates, and an atlas of maps. It bears every appearance of care and labor in its preparation, and of containing

[1] *Geology of Wisconsin, Survey of* 1873–1879. Vol. III, Accompanied by an Atlas of Maps. J. C. Chamberlain, Chief Geologist. Madison, Wis., 8vo. pp. 763.

a great mass of information, not only useful to the people of Wisconsin, but also of interest to geologists in general. It embraces chapters on the general geology of the Lake Superior region, by R. D. Irving; on the lithology of the Keweenawan or copper-bearing system, by R. Pumpelly; on the geology of the Eastern Lake Superior district, by R. D. Irving; on the Huronian series, west of Penokee gap, by C. E. Wright; on the geology of the Western Lake Superior district, by E. T. Sweet; on the geology of the Upper St. Croix district, based on the notes of the late Moses Strong, and edited by T. C. Chamberlain; on the geology of the Menominee region, by T. B. Brooks; and lastly on the geology of the Menominee Iron region. The volume is noteworthy from the valuable contributions to lithology, illustrated by numerous colored plates, and to the mining interests of the State, *i. e.*, the Huronian iron-bearing and the Keweenawan or copper-bearing rocks, these portions being well illustrated by maps.

Mr. Kingsley on the Crustacea belonging to Union College[1].—In this paper 103 species are noticed, two new genera (*Eupilumnus* and *Concordia*) are described, the genus *Heteractæa* of Lockington is recharacterized, and the name *Miersia* is proposed for *Ephyra*. The new species described are *Actæa spinifera*, *Eupilumnus websteri*, *Lithadia lacunosa*, *Pisosoma glabra*, *Concordia gibberosus*, *Alpheus websteri*, *A. packardii*, *Ozyris alphærostris* and *Pontonia unidens*. On the plate which accompanies the article, nine species are figured, seven of which belong to the genera Pisosoma, Eupilumnus, Euceramus, Concordia, Thor, Ozyris and Tozeuma, representations of which have never before been illustrated. All known genera of the Caridea of Dana are briefly characterized.

Crosby's Geology of Eastern Massachusetts.[2]—The Boston Society of Natural History, besides its Memoirs and Proceedings, has undertaken the publication of volumes entitled "Occasional Papers." The first was the Correspondence of Dr. Harris, the Entomologist; the second, Hentz's Spiders of the United States, and now it gives us the results of five years labor by Mr. Crosby, as assistant in the Museum, on the crystalline and primordial rocks of Eastern Massachusetts, a subject of high interest and of a good deal of difficulty. The introduction gives a general sketch of the topography and geographical features of that part of New England surrounding the Gulf of Maine. The result of the author's labors

[1] *On a collection of Crustacea from Virginia, North Carolina and Florida, with a revision of the genera of Caryonidæ and Palæmonidæ.*—Proc. Acad. Nat. Sci. Phila. 1879. pp. 383–427.

[2] *Occasional Papers of the Boston Society of Natural History.* III. Contributions to the Geology of Eastern Massachusetts. By William O. Crosby, Boston, 1880. Published by the Society. $3.00. 8vo, pp. 286, with an atlas and five plates of sections, &c.

is to bring out at least much more clearly than has before been done, the fact that between the crystalline and the oldest primordial rocks, "there is a great chronologic break, a 'lost interval' of immense duration," and also that the geological formations are oldest on the sea-board, becoming successively newer as we proceed from Massachusetts bay to the Berkshire hills in the western part of the State. Bearing these two points in mind, the volume will be read with much interest, afford food for further discussion, and doubtless will lead local geologists to a more careful study of their neighborhood. The region here treated of is most difficult to study and understand; a flood of light has been thrown upon the subject by Mr. Crosby, and many facts which will be of constant use in future discussions are here recorded. The map especially is an excellent graphic résumé of the subject. It is not often the case that a city society does so much as the one at Boston to promote the study of local geology, in this respect it has set a most useful example to similar organizations.

Brooks's Development of the Oyster.[1]—This is the first attempt to scientifiically examine our oyster, its breeding habits and mode of development; the result is a valuable addition to our knowledge of the American oyster, and a fresh discussion of the embryology of mollusks. Dr. Brooks shows that our species, like the European, is bisexual during the breeding season, and that the general mode of development, is like that sketched out by Lovén in his studies of the development of Cardium, a bivalve mollusk.

Unlike the European species, the eggs of the American oyster undergo development in the open sea, not within the shell. The process of segmentation is remarkable for its great rapidity, for the bilateral symmetry of the germ at this period, and for the well marked alternation of periods of activity with periods of rest. The ciliated germ is formed in some cases within two hours after fertilization, but twenty-four hours is the usual time, and it may sometimes require two days to reach it. There is an invaginate gastrula state, the primitive opening (blastopore) closing completely, the shell appearing at the point which the blastopore previously occupied, while directly opposite the position of the blastopore, the mouth and then the anus of the digestive tract make their appearance. The Veliger has the general form of that of Cardium and other Lamellibranchs.

Dr. Brooks thinks that the embryology of the oyster bears out his view that Lamellibranchs must be regarded as a side branch from the main molluscan stem, of which the Gasteropods are a much more direct continuation, "and that all attempts to trace the phylogeny of the higher Mollusca through the Lamellibranchs to

[1] *Johns Hopkins University, Baltimore. Studies from the Biological Laboratory, The Development of the Oyster.* By W. K. Brooks. No IV. Baltimore, 1880. 8vo. pp. 84. 11 plates.

lower invertebrates, are erroneous and useless." We would allow this, but none the less, in our view, are the Lamellibranchs a lower, less specialized division of molusks, than the Cephalophora and their gasteropod representatives.

The memoir on the oyster is succeeded by a brief discussion on the acquisition and loss of a food-yolk in molluscan eggs.

THOMAS'S CHINCH BUG.[1]—In this Bulletin, Professor Thomas has given the leading known facts regarding the ravages of the chinch bug, in the western corn growing States, and has collected the different views of entomologists as to the best means of prevention. The author shows by a lengthy series of statistics, that corn is injured much more than wheat. Enough for practical purposes is stated regarding the form and habits of this destructive pest, and as a brief manual, showing the best means of preventing its attacks, the pamphlet is timely, and will prove most useful to western farmers. The edition of 2000 copies issued by the Department of the Interior, was at once exhausted, and a new and much larger edition has been ordered by Congress. This is an evidence of the demand throughout the country for accurate information concerning this injurious insect, of the great need of careful, widely extended and comparative studies upon the other more destructive forms, and the wide diffusion of such knowledge among those most interested.

THE GEOLOGICAL RECORD.[2]—This valuable publication is again before us, and we bespeak for it the support of geologists and scientific men generally. Publications of this character are necessary for the student, and hence to the progress of science. They are not published for profit, and their editors are chiefly rewarded by a sense of their usefulness. While we congratulate the editor of the *Geological Record* on the general result of his work, we must encourage some of his collaborators to a little more care in some important details. Thus (p. 279) it is stated that among the "new" species of *Mammalia* described in the quarto report of Lieut. Wheeler, is "an undeterminable species of *Protohippus*!" Same page, bottom, it is stated that a paper "describes the generic characters of *Erisichthe*, adding specific descriptions," etc. "No age or locality given." The paper quoted states that the genus and one of the species are from the Niobrara Cretaceous of Kansas. Page 280, a list of species is given ending with *Monoclonius crassus*, which are said to be "new species founded on *Dinosaurian* teeth." The *M. crassus* was, as stated in the paper,

[1] *Department of the Interior, United States Entomological Commission, Bulletin No. 5. The Chinch Bug: its history, character and habits, and the means of destroying it or counteracting its injuries.* By Cyrus Thomas, Ph.D., Washington, 1879. 8vo, pp. 44, with a map.

[2] *The Geological Record for* 1877, *with supplements for* 1874–6. Edited by W. WHITTAKER, F.G.S. London, Taylor & Francis.

founded on a nearly complete skeleton. Under *Hedronchus sternbergi*, the recorder isolates the remark of the author that the typical specimen "has the appearance of the crown of a young tooth," thus conveying the impression that the author described it believing it to be such. This is really culpable carelessness. Page 281; *Tichosteus lucasanus* is said to have been founded on teeth; its teeth are really unknown. *Clepsydrops limbatus* is said to be from the Dakota beds of Colorado; it is described from the Texas Permian. Same page; "A (?) crocodilian tooth named *Suchoprion cyphodon;*" the text of the paper quoted states in several places that several teeth represent this species. Page 290, *Diceratherium* is called "the Eocene rhinoceros." The American species are Miocene. Page 291, "The beds this fossil ('Atlantosaurus') comes from are Jurassic and Cretaceous." No genus of reptiles is known to be common to the Jurassic and Cretaceous in America, least of all the one in question.

THE MIDLAND NATURALIST.[1]—Twenty-four monthly numbers of this valuable journal have been published for the years 1878–9. It represents the scientific activity of twenty-four scientific societies or field-clubs of the Midland Counties of England. The contributions embrace some of the best known names in natural history in England, as Allport, Cobbold, Gosse, Jeffreys, Whittaker, Woodward, &c. The discovery of specimens of animals previously unknown to England by members of the societies, and first published in this journal, is a matter of interest. Much that is of local interest and much new matter will be found in its pages, with a full synopsis of the proceedings of the various societies.

ROCKY MOUNTAIN HEALTH RESORTS.[2]—This is a thorough work on the sanitary conditions presented by the high altitudes of Colorado and its vicinity, by an enthusiast in this study. Dr. Denison has been pursuing his studies in this direction for several years. He is a practicing physician at Denver, Colorado. He has produced a real monograph on the subject which ought to prove of great service to our people visiting the Rocky Mountain region in search of health or rest. The book is well illustrated with maps, diagrams and tables, and the observations are systematically and clearly arranged. Consumption in all its aspects is treated in detail, as indeed all forms of pulmonary diseases.

PROCEEDINGS OF THE DAVENPORT ACADEMY OF NATURAL SCIENCES.—The second part of the second volume of this enterprising society evinces the same energy and self-sacrifice which

[1] *The Midland Naturalist.* The Journal of the Associated Natural History, Philosophical and Archæological Societies and Field Clubs of the Midland Counties. Edited by E. W. BADGER and W. J. HARRISON, F.G.S. Birmingham, England.

[2] *Rocky Mountain Health Resorts.* An analytical study of high altitudes in relation to the arrest of chronic pulmonary diseases. By CHARLES DENISON, M.D. pp. 192.

has characterized the history of this academy, now in the thirteenth year of its existence, and which merits especial mention. The volume is strong in archæological papers, by W. W. Calkins, W. H. Pratt, A. D. Churchill, J. Goss, Dr. R. J. Farquharson; these will be noticed more particularly in our department of Anthropology. Among zoölogical papers is Mr. Calkin's catalogue of the marine shells of Florida, with descriptions of several new species, and papers by Mr. H. Strecker, on the Bombycid moths, and an interesting account by him of hybrids between *Callimorpha lecontei* and *C. interrupto-marginata*. There are palæontological articles by S. A. Miller and W. H. Barris; but without disparagement to the other articles that by Mr. J. Duncan Putnam on certain bark lice called *Pulvinaria*, is of the more importance, from the careful manner in which the anatomy, internal and external, the development and metamorphosis of this singular insect have been discussed. This bark louse has attracted attention from the injury it has done to maples East, and especially West, and Mr. Putnam suggests various remedies. The crowded plates are drawn with care, and engraved by the author, and considering this is his first attempt, are well enough done.

HAYDEN'S GREAT WEST.[1]—This pamphlet while very popular in its treatment, is authoritative, written as it has been by one who has closely studied for over twenty years the physical geography, topography and geology of the Far West, and has had perhaps greater facilities at his command than any other geologist. After giving a brief history of the different surveys of the West, the mountain systems of the Cordilleras are described, followed by an account of the Yellowstone river and its tributaries, the Yellowstone park, and its geysers, the principal rivers of the Northwest, viz.: the geographical area drained by the Missouri river and its tributaries. Accounts of the tertiary lake-basins of the West with their numerous vertebrate fossils, are succeeded by those of the Snake river, its lava plains, the American and the Shoshone falls; and farther on the plateau of Colorado, with its high mountain peaks, and the Indian ruined towns and cave dwellings of the Southwest are noticed. Then passing westward over the Great basin, Great Salt lake is described, and finally the Sierra Nevada and the coast range, while the brochure ends with a brief account of the mineral wealth of the West, the fossils of the lignite, and lastly the stock-raising industry of the Western plains. The whole is the most interesting and reliable summary of the more striking features of the West that we have yet seen.

[1] *The Great West: its Attractions and Resources.* Containing a popular description of the marvelous scenery, physical geography, fossils and glaciers of this wonderful region, and the recent explorations in the Yellowstone park, "the wonderland of America." By Prof. F. V. HAYDEN, LL.D. Being an article written for a work entitled, "The Great West." Philadelphia, Franklin Publishing Company, 1880, 8vo, pp. 87.

VERRILL'S CEPHALOPODS OF NORTHEASTERN AMERICA.[1]—Very considerable interest is attached to the subject here discussed, owing to the fact that upon the European coasts there have been from time immemorial myths and legends concerning such sea monsters, all of which have passed under the name of "Kraken." Of late years these colossal cuttle fish have been stranded on the shores of Newfoundland, or captured by fishermen in adjoining waters, more commonly than on the European coast, and thus while we have no traditions of Krakens, we have been favored with a greater number of veritable specimens than the naturalists of the Old World. Prof. Verrill has been as fortunate as industrious in following up every trace and fragment of these large squids, and his numerous shorter contributions have resulted in the elaborate and detailed monograph before us. There are probably only three distinct forms among the large Newfoundland specimens of Architeuthis, and the author thinks that two of these may be merely the two sexes of one and the same species. The genus Architeuthis appears to be closely allied to Ommastrephes, the calamary. The paper bears evident marks of care and painstaking accuracy.

RECENT BOOKS AND PAMPHLETS.—Brainwork and Overwork. By H. C. Wood. 12mo, pp. 126, 1880. From the author.

Valedictory address of the graduating class of the Women's Medical College of Pennsylvania. By Francis Emily White, M.D. 8vo. pp. 16. 1880. From the authoress.

The American Bookseller. Vol. IX, No. 10, May 15, 1880. 8vo. From the publishers.

Observations upon the habits, structure and development of Amphioxus lanceolatus. By Henry J. Rice, S.B. (AM. NAT., Jan. and Feb., 1880.) 8vo, pp. 38, 2 pls. From the author.

The geological antiquity of Insects. By Herbert Goss. (From Vols. XV and XVI Ent. Month. Mag.) 8vo, pp. 50. 1880. From the author.

Geology of the provinces of Canterbury and Westland, New Zealand. By Julius von Haast. 8vo, pp. 486, pl., 1880. From the author.

Manual of the Indigenous Grasses of New Zealand. By John Buchanan. 8vo, pp. 175, pl. 61, 1880. From the author.

Man's place in Nature. By Joseph Le Conte. (Art. No. 10 from the Princeton Rev.) 8vo, pp. 23, 1880. From the author.

A catalogue of the official reports upon Geological Surveys of the United States and Territories, and of British America. By Fred. Prime, Jr. (From Vol. VII Trans. Amer. Inst. Min. Engineers.) 8vo, pp. 71, 1879. From the author.

Ethylization: the anæsthetic use of the Bromide of Ethyl. By R. J. Levis, M.D. (From the Med. Rec.) 8vo, pp. 8. From the author.

The numeral adjective in the Klamath language of Southern Oregon. By Albert S. Gatschet. (From Amer. Antiq., Vol. II, No. III.) 8vo, pp. 8.

The Spotted Salamander. By S. P. Monks. (From the Amer. Nat., May, 1880.) 8vo, pp. 3. From the authoress.

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[1] *The Cephalopods of the North-eastern Coast of America.* Part I. The gigantic Squids (Architeuthis) and their allies, with observations on similar large species from foreign localities. By A. E. VERRILL. (From the Transactions of the Connecticut Academy of Sciences, vol. V, New Haven, March, 1880) 8vo, pp. 177–257, 13 plates.

General Guide to the Museum of the Boston Society of Natural History. By Alpheus Hyatt. I. Introduction. 12mo, pp. 26, 1 chart, 1880. From the society.

The eleventh annual Report of the American Museum of Natural History, New York. 8vo, pp. 32, 1880. From the museum.

Syllabus of courses of lectures and instruction in General Geology, with reference to sources of information. By Alex. Winchell. 8vo, pp. 42, 1879. From the author.

Report of the Board of Commissioners Seventh Cincinnati Industrial Exposition. 8vo, pp. 408, 1879. From the Board.

Twelfth and thirteenth annual reports of the Trustees of the Peabody Museum of American Archæology and Ethnology. Vol. 2, Nos. 3 and 4., 8vo, 1880. From the museum.

Journal of the Cincinnati Society of Natural History, Jan. and April, 1880. Vol. II, No. 4, and Vol. III, No. 1. From the society.

Archives of Comparative Medicine and Surgery. Vol. I, No. 2, 8vo, April, 1880.

Proceedings of the Boston Society of Natural History. Vol. XX, Pt. III, April, 1879 to Jan. 1880. From the society.

American Journal of Science. May, 1880. From the editors.

On the structure and development of the skull in Lacertilia. Pt. I. On the skull of the common lizards (Lacerta agilis, L. viridis and Zootoca vivipara). By W. K. Parker. (The Croonian lecture.) (From Phil. Trans. Roy. Soc., 1879.) 4to, pp. 45, pl. 8. From the author.

The Geological Record for 1877. Edited by Wm. Whitaker. 8vo, pp. 432, 1880. From the editor.

La Revue Scientifique, Jan. 17, 1880. From the editor.

Illustrations of nests and eggs of birds of the Middle States, with text. By Thos. G. Gentry. Pt. I, 4to, 1880. From the author.

Bulletin Mensuel de la Société d'Acclimatation. 3e Sér., Tome VII, No. 1, Jan., 1880. From the society.

Diagnose d'une nouvelle et très petite espèce de Musaraigne de Madagascar. By Dr. E. L. Trouessart. (Ext. Journ. Le Naturaliste.) 8vo, pp. 1, 1880. From the author.

Note sur la Synonymie du genre Tanrec. By E. L. Trouessart. (Ext. du Journ. Le Naturaliste, 1880.) 8vo, pp. 6. From the author.

Note sur Quatre Espèces de Cheiroptères rares ou nouvelles pour la Faune Francais. 8vo, pp. 55. Révision des Musaraignes (Soricidæ) d'Europe et notes sur les Insectivores en Général. By E. L. Trouessart. Ext. Bull. Soc. d'Etudes Scientif. d'Augers, 1880. 8vo, pp. 24. From the author.

On a very small Shrew from Mayotte, Crocidura (Pachyura) coquerelii, Potten and vandam. By E. L. Trouessart. 8vo, pp. 5, 1880. From the author.

Notice sur quelques soudages aux environs de Mulhouse et en Alsace. Par MM. Ch. Zundel et M. Mieg. (Ext. Bull. Soc. Ind. de Mulhouse.) 8vo, pp. 11, 1880. From the authors.

Notes sur Rouchamp. Par M. Mathieu Mieg. (Ext. Bull. Soc. Ind.) 8vo, pp. 12, 1880. From the author.

Mesoplodon bidens, en Tilvæxt til den danske Havfauna. Af J. Reinhardt. (From Oversight d. k. D. Vid. Selsk. Forhdl. 1880.) 8vo, pp. 12. From the author.

Abbildungen von Vogel-Skeleten. Herausgegeben von Dr. A. B. Meyer. 1 Lief. 4to, pp. 8, pl. 10, 1879. From the editor.

Palæontographica. Beiträge zur Naturgeschichte der Vorzeit. Die Flora der Westfälischen Kreideformation. Von Prof. Hosius und Dr. von der Marck. 4to, pp. 241, pls. 44, 1880. From the authors.

Annali del Museo Civico di Storia Naturale di Genova. Vol. XIV, 8vo, 1879. From the museum.

Il Canton Ticino Meridionale ed i Paesi Finitimi Spiegazione del foglio XXIV. Tauf. colorita geol. da Spreafico, Negri e Stoppani per Torquato Taramelli. (Vol. XVII Mat. Carta Geol. Della Soizzera.) 4to, 1880. From the author.

Annales del Museo Nacional de Mexico. Tomo II, Entrega 1a. 4to, 1880.

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GENERAL NOTES.

BOTANY.

Effects of Uninterrupted Sunshine on Plants.—Professor Schübeler has made a series of observations on the effect produced by the almost unbroken sunlight of the short Scandinavian summer, on plants raised from foreign seed, *i. e.*, wheat from Bessarabia and Ohio. The general results are stated by the *Journal* of the Royal Microscopical Society, as follows:—

1. The grain of wheat that has been grown in low-lying lands, may be propagated with success on the high fields, and will reach maturity earlier at such elevations, even, although at a lower mean temperature. Such grain, after having been raised for several years at the highest elevation, which admits of its cultivation, is found, when transferred to its original locality, to ripen earlier than the other crops which had not been moved. The same result is noticeable in grain that has been transported from a southern to a more northern locality, and *vice versâ*.

2. Seeds imported from a southern locality, when sown within the limits compatible with their cultivation, increase in size and weight; and these same seeds, when restored from a more northern locality to their original southern home, gradually diminish to their former dimensions. A similar change is observable in the leaves and blossoms of various kinds of trees and other plants. Further, it is found that plants raised from seed ripened in a northern locality are hardier, as well as larger, than those grown in the south, and are better able to resist excessive cold.

3. The further north we go, within certain fixed limits, the more energetic is the development of the pigments in flowers, leaves and seeds. Similarly, the aroma or flavor of various plants or fruits is augmented in intensity the further north they are carried within the limits of their capacity for cultivation; and conversely, the quantity of saccharine matter diminishes in proportion as the plant is carried further northward.

Destruction of Insects by Fungi.—Prof. Elias Metschnikoff, the distinguished Russian Embryologist, has, according to *Nature*, recently investigated this subject and has given an explanation of the possible value of yeast application more satisfactory than that adopted by Dr. Hagen. The general result of the most accurate investigations of the beer-yeast fungus *(Saccharomyces cerevisiæ)*

is entirely opposed to the notion that it can enter an insect's body, and produce a disease. Metschnikoff has examined other minute fungi, and has by experiment proved their very deadly character to the insects exposed to infection; one of the most destructive is the green muscardine *(Isaria destructor)*. He has cultivated the spores in quantity by the use of beer-mash; in this decoction, the green muscardine produced a rich mycelium and finally spores. Metschnikoff recommended the cultivation of an insect-disease-producing fungus in quantities to places infested by these insects. Will not some of the numerous microscopists in this country make a practical application of this discovery to the destruction of our noxious insects? It might be readily tried this summer on the currant saw-fly worm, or canker worm, tent caterpillar, the potato beetle, or any other destructive insect which can be experimented upon in large numbers near the laboratory.

The Origin and Survival of the Types of Flowers.—In a lecture delivered before the California Academy of Sciences, October, 1879, Prof. Cope proposed the hypothesis that "the consciousness of plant-using animals, as insects, has played a most important part in modifying the structure of the organs of fructification in the vegetable kingdom. Certain it is that insects have been effective agents in the preservation of certain forms of plants" (American Naturalist, 1880, p. 266). Dr. Hermann Mueller has recently published a book in which he seeks to explain the existing variations in the forms of flowers on the principle of selection. He supposes that insects of different tastes bred peculiar flowers, just as men breed peculiar races of cattle. Carrion-loving insects bred their kind of flowers, and long tongued insects, the tubular kinds, and many other classes of insects have, each class, bred the flowers they love best.

Dr. Mueller is abundantly able to theorize on this subject, and his views, so far as they go, will command the assent of most persons. But like all the Darwinians, he confounds survival or preservation of characters, with the origin of characters. On this subject Prof. Cope has the following (l. c. 266): "I would suggest whether the mutilations and strains they [plant-using animals] have for long periods inflicted on the flowering organs may not, as in some similar cases in the animal kingdom, have *originated* peculiarities of structure."

Botanical Notes.—Dr. Parry during his explorations in southern California, discovered a handsome new lily, which has been described by Mr. Watson as *Lilium parryi*, in the Proceedings of the Davenport Academy of Natural Sciences, with an excellent plate. The second volume on the botany of California, by Mr. Watson, is now going through the press, and will be published in midsummer.——A revision of the genus *Pinus*, by Dr. Engelman, appears in the Transactions of the Academy of Science of

St. Louis, February, 1880, illustrated by three plates.——In the *Bulletin* of the Torrey Botanical Club, for April, Mr. F. Wolle gives a fourth list of fresh water algæ mostly found in the vicinity of Bethlehem, Pennsylvania, of which at least ninety are new to the United States flora, and a number are described as new to science.——A communication on the "influence of electricity upon the growth of plants," was presented by Mr. J. M. Batchelder, of Boston, to the Club. The author sowed "pepper-grass" seeds on cotton floating on the surface of distilled water contained in two tumblers. One of the tumblers was insulated, and in it was placed a coiled copper wire, the other extremity of which communicated with a revolving belt. Both tumblers were placed under the same conditions of light and heat. It was found that the electricity retarded both the germination of the seeds and the subsequent growth of the plants to a remarkable degree. At the conclusion of his experiments, Mr. Batchelder discovered that while the roots of the plants in the non-electrified water were growing normally, those submitted to the action of electricity were twisted and coiled in an intricate manner among the fibres of the cotton.——A new species of Potamogeton (*P. illinoiensis*) is described by T. Morong, with notes on other species in the *Botanical Gazette*, for May. In the June number, G. Engelman notices the vitality of the seeds of serotinous cones, and E. L. Greene publishes notes on certain silkweeds.

ZOÖLOGY.[1]

THE HERRING OF THE PACIFIC COAST.—The herring fishery is scarcely so important upon the coast as upon those of the Atlantic. How much of this is due to the herrings, and how much to the human inhabitants of the region is hard to tell. The species of Clupea, commonly known here as the herring, *Clupea mirabilis*, is, I believe, smaller than the Atlantic herring, and hitherto the cured fish has not been able to compete with the Eastern article. This, however, is not due to any scarcity of the fish, which occurs in shoals all along the coast at certain seasons, and is always abundant in the more northern regions. The herring found along the coast of the United States are said to be much inferior to those taken between Puget sound and Oonalashka.

Some have been cured in Humboldt bay, but Humboldt herring are said to be very poor. The Alaska Fish Company have put some up at Oonalashka, which, having been very carefully cleaned and prepared, were sold to restaurants and oyster shops for lunch herring, and the Cutting Packing Company salt some at Sitka. The Indians press the whole fish for oil, and the spawn is kept to form part of their winter supply of food.

Besides the herring, we have another Clupea, *C. sagax*, com-

[1] The departments of Ornithology and Mammalogy are conducted by Dr. ELLIOTT COUES, U. S. A.

monly called the sardine. This species comes into market in small quantities about April, becomes abundant in July and August, and appears occasionally at least as late as the beginning of November. Those brought in in April, May and June are chiefly young fish.

The herring begins to arrive in our markets at the end of September, and will, I am told, be in season during the rainy season. All that are brought to San Francisco are eaten fresh.

The anchovy, *Engraulis ringens*, is exceedingly abundant in this bay, and it is to be wondered at that more persistent efforts have not been made to preserve them, or to make sauce from them.

The "Columbia river sardines" occasionally sold in the shops, are not sardines in any sense. Those I have seen are the Eulachon, *Thaleichthys pacificus*, a small fish of the salmon tribe. The Eulachon is very oily, and probably makes very palatable potted fish, but one can't make a sardine out of a salmon.

The young of either of the species of Clupea would make real sardines, or at least the nearest thing to them possible on this coast. The sardines of commerce are the young of the pilchard, *C. pilchardus*. These three species are the only true herrings found on this coast, but the related and world-wide species, *Albula vulpes*, the lady fish, is tolerably common farther south, and occasionally puts in an appearance in our markets among the fish from Monterey.

The anchovy can be readily known by its comparatively very large mouth, the under jaw of which is much shorter than the upper; but the two Clupeæ, though seen to be quite different when placed side by side, are not so easy to distinguish without examination. I will give a few of the principal distinguishing characters:

Clupea sagax.—Body thick, elongate, depth to length as one to six; thickness two-thirds of depth; head slightly more than one-fifth of total length; lower jaw scarcely projecting; no teeth in mouth, no denticulations on lower margin of maxillary; operculum striated; anterior margin of dorsal nearer the tip of the snout than to the origin of the caudal; area included between the ridges on the top of the head narrow, pointed posteriorly; a row of dark spots on each flank.

C. mirabilis.—Body short, compressed, depth to length more than 1.5, thickness about two-fifths of depth; head not more than one-fifth of total length; lower jaw considerably projecting; a few small teeth in mouth, lower edge of maxillæ denticulated; operculum smooth; anterior margin of dorsal fin slightly nearer to the origin of the caudal than to the tip of the upper jaw; area included between the ridges on the top of the head an elongated ellipse; no spots along the sides.

—*W. N. Lockington.*

Recent Articles on Crustacea.—About a year and a half ago a request was sent to the various museums of the world by Drs. Schiödte and Meinert, of Copenhagen, requesting the loan of all specimens of Cymothoidæ, for the purpose of monographing the group, and the first portions of the monograph have just ap-

peared.[1] From it we learn that only two American museums contributed, the Peabody Academy of Science at Salem, Massachusetts, and the Museum of Comparative Zoölogy, at Cambridge. The first of these papers treats of the Cirolanidæ, which closely resemble the true Cymothoas, but which differ in having the mouth parts adapted for eating flesh. Three genera and nine species are characterized, of which the genera Barybrotes and Tachæa, and the species *B. indus*, *B. agilis*, *T. crassipes*, *Corrallana collaris*, *brevipes*, *nodosa* and *hirsuta* are new. Each species is described as far as the specimens permitted, under three heads—male, virgin, and ovigerous females—the difference between the sexes and between the two forms of the same sex being very striking. In the second paper the Ægidæ are monographed. These Crustacea lead a parasitic life, generally attaching themselves to the roof of the mouth of fishes, and with their modified mouth parts, which form a sucking tube, living on the blood of their hosts. These forms are described under the following generic and specific names, those starred (*) being new: *Ægæ tridens*, *hirsuta**, *crenulata*, *webbii*, *strœmii*, *rosacea*, *serripes*, *psora*, *deshayesiana*, *antillensis**, *magnifica*, *monophthalma*, *nodosa**, *opthalmica*, *tenuipes**, *dentata**, *incisa**, *arctica*, *ventrosa* and *spongiophila*, *Rocinela danmonensis*, *insularis**, *dumerilii*, *maculata**, *americana**, *orientalis**, *australis**, *signata** and *aries**, *Alitropus typus* and *foveolatus**. Full descriptions are given of the male, virgin, ovigerous female and the young. The plates are engraved by Lövendal, the best living scientific engraver, and are simply beautiful; the text is in Latin, which is far better for the man of average education than would be the native language of the authors, and in short, the articles are models of scientific work.

Mr. Edward J. Miers has at various times since 1874 published several valuable papers on the Crustacea, some of which have been noticed in the pages of the NATURALIST. A number of these papers have been especially valuable from the fact that they embraced all the known species of certain families and genera. His twenty-third paper has just been received, and is of the same character as his "Revision of the Plagusiinæ," "Notes on the Peneidæ," "Revision of the Hippidea" and "On the Classification of the Maioid Crustacea." In the present paper[2] the Mantis shrimps are monographed, fifty-three species being enumerated, distributed in six genera. There is one feature of Mr. Miers's work, which is to be especially commended; in these days of much species making, his tendency is just the reverse, and we

[1] De Cirolanis Ægas simulantibus commentati brevis scripserunt. J. C. Schiödte et Fr. Meinert. Naturhistorisk Tidsskrift III, XII, pp. 279–302, Pls. III–V (1879.)

Symbolæ ad monographium Cymothoarum Crustaceorum Isopodum Familiæ scripserunt J. C. Schiödte et Fr. Meinert.

I Ægidæ. l. c. pp. 321–414 Pls. VII–XIII (1879). From the authors.

[2] On the Squillidæ. Annals and Magazine of Natural History for January and February, 1880, pp. 49, Pls. I–III.

think generally that he is right. As an instance of his onomaclastic spirit (to coin a word), the fifty-three species of Squillidæ have been described under seventy-six different specific names. The new species described are *Lysiosquilla brazieri, gonodactylus, excavatus* and *9-furcicaudatus*. A new genus *Septosquilla* is created for *Squilla schmeltzii* A. M.-Edw. and *Chloridella* is substituted for *Chlorida*, preoccupied. The plates are fair.—*S. S. Kingsley.*

Another Black Robin.—In the Bulletin of the Nuttall Ornithological Club for January I described a case of melanism in *Turdus migratorius*, the specimen being taken from a nest at Freehold, New Jersey, last summer. I have lighted on another specimen taken from a nest the same season, in Hudson county, New Jersey. In this instance the color is more intensely black, and the neck has considerable of that play of metallic luster, of a purple hue in the varying light, which we see in the crow-blackbird, *Quiscalus purpureus*. The Freehold specimen is of a sooty-hue, not unlike the color of the rusty grackle, *Scolecophagus ferrugineus*. The Hudson county specimen was owned by a saloon keeper near Jersey City, who set a fancy price on his bird, and failing to find a purchaser, at last accounts, was trying to raffle off his *rara avis* at two dollars a chance.—*S. Lockwood, Freehold, New Jersey.*

Occurrence of the Bohemian Wax-wing in Western Washington Territory.—The past winter has been an unprecedented one, snow having fallen to the depth of from two to three feet in the valleys—the lowest observed temperature was + 8°, which, however, was not as cold as before known. Coincident with the snow, appeared for the *first time in the history of the country*, the Bohemian wax-wing *(Ampelis garrulus)*.

Many flocks of these beautiful birds were seen in various parts of the country, the greatest number observed in one flock was about two hundred. They were feeding mostly on the capsules of the wild rose *(Rosa fraxinifolia)*, which are abundant here, the crops of some I dissected were literally crammed with these seed vessels.

Since the first of February none have been seen, hence I conclude that, with the disappearance of the snow, they have retired to colder regions.—*J. K. Lum, Lewis county, Washington Territory.*

Rose-Breasted Grosbeak and Colorado Potato Beetle.—Regarding this useful and pleasing bird, the following appeared in the *New York Weekly Tribune*, of February 11, 1880, to wit: "Prof. C. E. Bessey, of the Iowa Agricultural College, several years ago observed the rose-breasted grosbeak's habit of feeding on the Colorado potato beetle * * *. Its useful propensity was again remarked during the past year by a correspondent of

Forest and Stream at Coralville, Iowa, and by another at Ames in the same State." In a small aviary which I keep for better observing the habits of our native and several foreign song birds, the same preference in the selection of food was noticed by myself. September 18, 1879, I found in the flower bed of my yard, a potato beetle *(Doryphora decem-lineata)*, which I intended to give to my cardinal grosbeak *(Cardinalis virginianus)*. After placing it in the cage, it was with difficulty that I prevented the rose-breasted grosbeak *(Hydemeles ludoviciana)* from seizing it at once. Knowing the potato beetle to be poisonous, at least to the genus *Homo*, I did not care to try experiments with the tame rose-breasted grosbeak, my sweetest songster in the aviary. I had often before noticed, that the cardinal grosbeak had a fondness for beetles, and naturally supposed that he was better qualified to judge of the wholesomeness of the food offered.

The latter bird watched the beetle very attentively as it crept over the floor, but seemed to be in no hurry to capture it as he would other beetles. Finally he took hold of and crushed it between his mandibles. He tried to swallow it, but not finding the taste very appetizing, he gladly yielded up the unsavory morsel to the repeated snatchings of the rose-breasted grosbeak. After crushing it into a shapeless mass, which occupied but a few seconds, he carefully stowed it away. I thought he seemed not to enjoy the taste very much, as he gravely shook his handsome head as if in a doubtful mood. Wiping off his bill, he immediately afterwards proceeded to eat a quantity of cultivated portulaca that I offered as a precautionary measure. Portulaca stems and leaves contain much mucilage, which I thought would be an antidote to the possible acrid quality of the juice of *Doryphora decem-lineata*. The usual result of poisoning from handling these crushed beetles, as well as from inhaling the fumes arising from vessels in which *D. decem-lineata* have been scalded, has been likened to serpent and scorpion-poisoning. Where death followed, the blood would become disorganized the same as from septæmia. However, in the case of the birds no evil effects were noticed. In mankind, idiosyncrasy favors the absorption of the volatile doryphora poison.

In looking over my notes, I find also that the cardinal grosbeak is fond of the rose beetle *(Macrodactylus subspinosus)*, a species of an ill-smelling bug frequently found on the fruit of raspberries, and centipedes he always devoured, whereas none of the others would go near them. Sow bugs *(Oniscus asellus* L.) were eaten by the cardinal grosbeak and yellow-breasted chat *(Icteria virens)*.—*Richard E. Kunze, New York.*

Can Snails Mend their Shells.—Having some doubts whether snails are able to mend their shells when broken, I procured a full grown water snail *(Lymnæa elodes* Say), and with a pair of pinchers broke out a semi-circular piece, the size of a half dime, and then

placed it in a tub of water containing aquatic plants. Everything being in order, I took notes of changes as they occurred. At the end of three days no change had taken place in the size of the aperture, but the sharp edges where the shell was broken, was somewhat rounded, showing plainly that the work of repair was going on. At the end of six days the opening was perceptibly smaller. At the end of two weeks so much progress had been made that the opening was one third closed, and the line where the patching commenced, although very smooth, could be distinctly seen. I continued to watch my pet from day to day with more and more interest, until finally at the end of six weeks the work was completed, and to all appearances as smooth as it was before it was broken. It was very interesting to watch its movements, it would make a circuit around the side of the tub, and then push off toward the middle, where the food plant was anchored, and feed awhile, and then return and make another circuit. Occasionally it would disappear for some time to tend to duties below, probably to lay eggs, as I found them very numerous on the side of the tub, and in the fall when the tub was emptied, scores of young snails were found sticking to the sides.—*Robert Bunker.*

Victimizing Rattlesnakes.—A short time since a gentleman related to me a novel way of depriving the rattlesnake of its poisonous powers. In parts of the West where this species *(Crotalus confluentus)* is more common, and most annoying, a person attaches a silk handkerchief to a stick, and holds it over the reptile. The instant it darts its fangs into the silk, the handkerchief is jerked up, and the fangs removed. After this the snake is of course powerless, and may be used in any desirable way. I have never seen the experiment put in effect, and give it for what it is worth.—*W. H. Ballou.*

Bythinia tentaculata Linn.—In June, 1879, I discovered *Bythinia tentaculata* Linn., at Oswego, New York. A little later it was identified in the Champlain canal, at Waterford and Troy, and this spring I have found it plentiful in the Erie canal, at Syracuse, New York. In some localities it is already abundant, and will soon be a widely distributed shell. It must have been introduced from Europe some time since, but had hitherto escaped notice.—*W. M. Beauchamp.*

Color Variety of the Chipmunk.—A curious color variety of *Sciurus hudsonius* Pallas, was brought to us not long ago, and has seemed worthy of a brief notice. That it is a variety of *S. hudsonius* is unquestionable. In general color it is less brown than any specimens in our collection. A band of rather dull reddish-brown runs along the median line of the back from the top of the head, just behind the eyes, to the base of the tail. This tinge dies out as it proceeds toward the lateral parts of the body, and

is utterly wanting on the legs. The white color of the under side of the body is distributed as is usual in this species.

The tail is narrow and not at all bushy, and reaches about to the neck of the specimen; it is white with a very few reddish hairs on the upper surface of the part nearest the body. A very few black hairs may also be seen very sparingly scattered throughout.

Two specimens of this variety were observed in the trees of Middletown, and one of these, captured in a trap set for rats, is the individual now before me.—*H. L. Osborn.*

Ferocious Tendencies of the Muskrat.—It is possible that others have commented on the unnatural and ludicrous attacks of the muskrat *(Fiber zibethicus)* on man. However that may be, I have some incidents in point which may serve to throw light on the matter.

I was sauntering along a prairie road just out of Boone, Ia., one night during the past winter. There was no snow on the ground and the moon was just glimmering through the clouds. Of a sudden I was startled by the appearance of some animal from the long grass by the wayside, which dashed up my leg. I knocked it off, picked up a frozen piece of mud and broke its leg. Again it made a rush for me, and another piece of mud sent it rolling over. I took hold of its tail during this little scene, and ended the matter by giving its head a severe bump on the ground. When I had access to more light I found that it was a full-grown muskrat of enormous size. I can neither account for its attack nor appearance there. The previous summer season had dried up all the sloughs and there was no water in the vicinity. The houses of these animals had been deserted for some time previous, and nowhere on the prairies had I been able to find one with any inhabitants (they build in the sloughs of western prairies extensively). Alone and well away from its most natural element it had attacked me without provocation. The matter led to an inquiry among the farmers. The general statement was to the effect that considerable fun and some trouble was had with this species during each hay time, as they did not hesitate, when out of the water, to ferociously attack man or beast, with seldom any damage. One man related, however, that he received a severe bite in the hand from one of them, which laid him up for some time. It is either very courageous or very luny.—*W. H. Ballou.*

Nesting English Sparrows.—During the entire month of February, the English sparrows *(Passer domesticus)* have been busily engaged in Chicago, preparing their nests. Long before the arrival of other park birds, they have selected all the nesting boxes and hundreds of nests are completed. This is my first observation of this game being played, and I believe that it is an advantage they have taken of migrants to secure nesting places

without trouble. They may be seen any day picking straws out of the street. What our summer birds will do, or whether they will remain here or not, remains to be seen. In reference to the spread of these birds in the Western States, I have this observation: In central Iowa, are two cities, Boone, and Boonesboro, situated a mile apart. The intervening space is well trodden with roadways. During the past winter I have noticed literal thousands of sparrows on the snowless ground here, picking the seeds and scratching over the manure. They have carefully treasured up the trick of the small boy, and any attempt to pick up a stone, results in their immediate departure. So pestiferous have they become, that the State legislature of Iowa has their extermination under consideration. They use the great lines of railways for guidance West, and last spring while on my way to New York, they were seen migrating in flocks westward, all the way from Chicago to that city. In an Eastern city, I noted that one side of a beautiful brownstone church was covered to a remarkable extent with their filth. In spite of their rapid increase and filthy habits, however, I am disposed to believe that they are of *some* use.—*W. H. Ballou.*

Bird Arrivals at Evanston, Ill.—The arrivals of robins at Evanston, Ill., on the 12th day of February, is something unheard of in the annals of the ornithological records of this section of the country. The following is a portion of the records of *Turdus migratorius* in previous years:

1877	arrived	February 27.
1878	"	March 8.
1879	"	March 12.
1880	"	February 12.

The thermometer has indicated quite a high temperature for the latitude of Evanston, about 41° 52′ 57″, north, 42m. 18s. west longitude from Washington, and 5h. 50m. 30s. (from Greenwich), for the entire month of February, and up to the 25th, the mercury has not reached zero. On this account perhaps, the birds have remained contentedly, and their chipper is occasionally heard. About twenty specimens have been seen here. The migrations are limited up to this writing to this one species. They have not yet begun nesting in this vicinity.—*W. H. Ballou.*

Gadus morrhua in Fresh Water.[1]—The catalogue below quoted includes strictly fresh-water fishes only, and such marine fishes as are frequently found in fresh water. I have, however, been somewhat perplexed by a couple of species, which are stated by C. E. Varming, a merchant in Kolding, to be caught now and then in Kolding rivulet, namely Torsk *(Gadus morrhua)*, which in September and October is caught in abundance, and Tangsnarr *(Spin-*

[1] Fortegnels over de Danske Ferskvandsfiske. Ved Arthur Feddersen. Naturhistorisk Tidsskrift 3. R. 12. B. 1-2. H. 1879. Foot note on pages 69 and 70.

achia vulgaris). Indeed, in the rivulet mentioned my countryman has even himself caught or seen caught the common Kulmule *(Merluccius vulgaris)* and Pighaien *(Acanthias vulgaris)* which are not found elsewhere on the coast. The Torsk is said of late years to go quite up to the basin at Odense; in the rivulet, however it ascends scarcely beyond Korup.—*Translated by Dr. Bean, and received from Prof Baird, Secretary of the Smithsonian Institution.*

Rev. Mr. Dallinger on the Theory of Spontaneous Generation.—In a valuable paper in the Journal of the Royal Microscopical Society for February, the author records the results of a series of experiments made to determine the thermal death point of known monad germs, when the heat is endured in a fluid. He made it plain, that a temperature of 140° to 142° Fahr. is absolutely destructive of the adult monad. The spores of six monads in the case of heat endured in a fluid were killed at the following temperatures: the first were destroyed at from 267° to 268° Fahr; a second form had its spores devitalized at 212° Fahr., *the normal boiling point of water;* but in a dry heat, it could endure 250° Fahr; a third died at 250° Fahr. in dry and 232° Fahr. in fluid heat; the spores of a fourth form (a cerco-monad), were destroyed at 238° Fahr. in fluid heat, surviving at 260° Fahr. dry heat. There were two species that could just survive 300° Fahr. in the dry heat, but perished in fluid at 268° Fahr. and 252° Fahr., respectively. The smallest spores survived the heat best.

Mr. Dallinger thus concludes: "The bearing of these results on the deeper questions of biology is plain; at least they show on the most superficial glance, the error of assuming the abiogenetic origin of septic organisms that may have arisen in closed vessels, *because* they were heated to a sufficient temperature to destroy the adult, or to any temperature less than that *known* to be destructive of the germ. They show equally the need of enlarged and earnest work in this somewhat difficult but most fruitful field of labor. The question of the *present* origin of living things, or living matter in any form, will be most surely narrowed by degrees, and settled, so far at least as our present optical aids can carry us here. The question of 'spontaneous generation' *versus* abiogenesis, is in its final form, a question for the biologist, or rather for biology. It can avail little in the quest for truth, in this matter, to assume the issue, and work up to it; nothing is easier than this in such an inquiry. With modern students of biology, I suspect that at the beginning, the bias of the mind was towards the present or continued transition of the non-living, into the living, without the intervention of living things. This on a superficial view at least, seemed to be required by the doctrine of evolution, and at least represented my own view in approaching the question. But the *facts* were eloquent; besides which a closer study of the great

doctrine of development, shows that it by no means involves, but rather disallows, the existence of continued transformation of the not-living into the living, unless passed through, so to speak, the alembic of life. To suppose any hesitancy on the part of any truly scientific mind in receiving the evidences of abiogenesis if they could be satisfactorily shown, is too ridiculous for repetition. It would be more than weakness, however, to receive as evidence what is not such. Let *truth* come from whence it may, and point never so grimly to where it may, he would be recreant to science, who would for one moment hesitate to receive it. But not less false is it to the foundation principles of true science, to accept as true, what must constitute the roots of vast generalizations, except on evidence which no future scrutiny or analysis can shake."

THEORY OF BIRD MIGRATIONS.—I am not aware of the applicability of the following to all parts of the country, but am convinced that I have the facts in regard to the migrations of birds in Illinois. For four seasons I have carefully noted the bird arrivals in Illinois, the results of which have been published in the Chicago *Tribune* as annual reports.

In each instance noted, the first four species to arrive and which all arrived together, were the robin, meadow lark, grosfinch and bluebird. In each instance these species came with a terrific gale of hot wind from the south, which lasted some two or three days and nights. The thermometer on each occasion stood at 70° F. Now to my mind the time of migration is set by the continuance of this excessive heat and current of air.

I have two proofs of this. In 1878 there was an open winter and they did not arrive until late in the spring, though the thermometer stood generally at 30° and 40° each day. It was not until the several days of hot air with a thermometer at some 70° that they arrived.

Again, this season a hot air current came, lasting one day and part of a night, with the mercury at 70°, only a few robins came, and the migrations were not general even with this species; the other three species wisely staid away, waiting for the usual three days of hot air. I am confirmed in this opinion in the fact that in the spring of 1879 I wrote out my account of the bird arrivals for this region (Evanston, Ill.), and five days later visited Northern New York; there was four feet of snow at Oswego, and of course not a summer bird had made an appearance. It was about the first of April when the three days' current of hot air reached Oswego county, and then the birds arrived.

Migrations, then, depend, as to time, on a continuous current of hot air and high temperature, extending at least through sixty hours.

As to the route of the migrations, I coincide with the opinion

expressed at least by Theodore Jasper in his "Birds of North America," that they follow mountain ridges and water courses.—*Wm. Hosea Ballou.*

ALBINO BEAVER AND SQUIRREL.—During the past winter a white beaver *(Castor fiber)* was caught near Olympia, Washington Ter. The specimen was a large one, and remarkable for the purity of its color; the hairless tail, as well as the whole body being entirely white. The specimen here mentioned was preserved and may be seen in Olympia.

While traveling in Douglass county, Oregon, I came across a white squirrel *(Sciurus fossor)*. This squirrel is abundant in the neighborhood, and is remarkable for the constancy of its coloration, this being, I believe, the first recorded instance of an albino of the species. The coloration was white with a slight buffy tinge.—*J. K. Lum.*

SOME HABITS OF THE PINE SNAKE.—The note in January NATURALIST on the vibration of the tail in certain species of snakes, leads me to ask if this habit is not more general than has been supposed. The pine snake, *Pituophis melanoleucus*, is naturally sluggish, yet I have seen it when excited so vibrate the tip of the tail that it looked like a little fan, though I never detected any sound. Twice have I had the pine snake lay eggs in my study, the largest number being twelve, but they were as large as pigeon's eggs. For many years have I been on the lookout to find the egg nidus of this serpent, and only succeeded in the early summer of 1878. This was in an open sandy spot in the pines near here, about three inches below the surface. The deposit contained forty one eggs, but very much smaller than those laid in confinement. I had them all brought to my house, and made a vain effort to hatch them. At last I broke open a few, and found each to contain a young snake about five and a-half inches in length. The number of eggs and the size of the young snakes severally compared with the size of the egg much surprised me.—*S. Lockwood, Freehold, N. J.*

NOTES ON THE FISH-HAWKS.—In the "Naturalist's Guide" (1877), Part XI, "Catalogue of the Birds of Eastern Massachusetts," by C. J. Maynard, on page 134, is the following note, viz.: "*Pandion carolinensis* Bon., fish-hawk. Not a common summer resident, growing less so every year. Perhaps a few breed in the interior, but it is doubtful." Mr. Maynard also placed the bird in his list of "regular spring and autumn migrants," *vide* page 165.

I was much surprised when I read this note, as no bird is more familiar in this locality than the fish-hawk. It is with us a regular summer resident, arriving early in the month of March, and departing late in November, and breeds every season quite abundantly. From more than a quarter of a century's personal obser-

vation, I can attest that these hawks have not perceptibly diminished in numbers in this vicinity, and I can find a dozen or more nests of this species, each within an hour's drive of my home, which have been occupied by them every season for years, and in which they have annually reared their young. For nearly nine months of the year I can look up any day and almost any time of day and see one or more fish-hawks watching for prey, or going to and from the nest. Some of the nests are located near the banks of Taunton Great river, or on the shores of Mount Hope and Narragansett bays, and some are situated a mile or more from the water. Perhaps I live in a paradise for fish-hawks, but I should not have been more surprised to have read that the robin, blue-bird and song sparrow were uncommon summer residents, and that but few of them bred in this region. Though not so numerous as swallows or blackbirds, if the phrase "common summer resident" is applicable to any representative of our avifauna, it is applicable to *Pandion haliætus*. The osprey begins to build a new, or much more commonly, to repair an old nest soon after their arrival. From two to four eggs are the usual complement, and incubation commences in May. While the female is setting, the male brings her food, and at times takes charge of the eggs as the mate goes off for an airing. One of the pair is on or in sight of the nest from the time incubation begins until the young are able to shift for themselves. I have repeatedly seen the female on the nest, and her mate perched on a limb of the tree preening his feathers or murmuring a not unmusical strain, evidently as a solace to his companion, while robins, blackbirds and sparrows lit upon the branches and sang their melodious refrains apparently unnoticed by the hawks.

Harmless to the agriculturist, protected by the fisherman, watched with intense interest by all who care for our birds, second to none in the matchless majesty of his mien, the fish-hawk is seldom molested save by the oölogist and ornithologist, or the mere collector of eggs.—*Elisha Slade, Somerset, Massachusetts.*

Polymorphous Anodontæ.—Nearly all collectors of shells are familiar with the extensive synonomy of the European *Anodonta cygnea*. Dr. Lea, in his Synopsis of the Unionidæ, reduces to its synonomy more than one hundred specific names. It would seem that, in their descriptions of shells, the Old World naturalists have given specimen characteristics rather than more or less permanent species diagnoses. This unfortunate polymorphous shell has thus afforded abundant material to the mere species monger, and has no doubt been a "thorn in the flesh" to youthful collectors. This European shell, however, finds a rival, though on a much less extensive scale, among its American relatives. For

some years the writer has been receiving specimens of a polymorphous *Anodonta*, ranging geographically from New York to Western Iowa, including the important streams throughout this entire range. These shells have been received under the various specific names of *Anodonta grandis* Say; *A. plana* Lea; *A. decora* Lea; *A. hockingensis* Moores, MSS.; and *A. somersii* Moores, MSS. A very careful diagnosis of the exo-skeleton of all, and the soft parts of some of these, has convinced me of their specific identity. The following observations are based, in part, upon correspondence from various gentlemen who have kindly forwarded me specimens for examination.

In Keokuk lake, about five miles from the city of Muscatine, Iowa, *Anodonta grandis* is found in great abundance. The shells vary in shape from a short full round form to a long and flat form; some are quite thick, others remarkably fragile for their size. For some unexplainable reason, as Prof. Witter writes, the young of *grandis* are rarely taken in this lake. Now, this remarkable diversity of form in this single locality is a fair representation of the increasingly proximate gradation in these abovementioned species from New York to Western Iowa. The form known as *decora* Lea, from New York could not be distinguished readily from the *grandis* at Muscatine. The shells from that State are less heavy than from any other section represented in my cabinet. The Eastern forms are more compressed as to the beaks, rather more inflated, and having the posterior dorsal slope rather more oblique. From Ohio were received forms with much thicker shells, and white prismatic nacre. Both *decora* and *plana* from that State has a much more brilliantly colored epidermis than any of the more Western forms. In this respect they sustain to *grandis* essentially the same relation that the brilliantly colored *Unio siliquoideus*, sustains to *U. luteolus* Laur., of which it is only a variety. In Indiana, Illinois, and Iowa, the most marked difference appear to be in the coloration of the nacre, which varies from white to a very deep salmon, the latter being the most constant color in the Western limit. The two species described by Mr. Moores, mentioned above as manuscript descriptions, are, beyond doubt, the young of *grandis*. Carefully comparing all my specimens, some sixty in all, with typical *grandis*, the conclusion reached was that these forms are all varieties of Mr. Say's shell, which was further strengthened by the fact, that being arranged geographically, from the East to the Mississippi, the former gradually approach the shell described by Mr. Say in 1829. Their differences correspond in general with the modifications of the mantle, some of them being sexual, but the major part may be explained on the basis of distribution and the changes in environment which this implies.—*R. Ellsworth Call, School of Science, Dexter, Iowa.*

PRELIMINARY NOTE ON BRANCHIPOD CRUSTACEANS.—In an isolated small pool, with a white clay bottom, containing milky colored fresh water near Maspeth, Long Island, I found in January last immense numbers of a full-grown, transparent species of Branchipod, which transparency as well as some morphological differences I adjudge to be owing to the fact that Branchipods and many Entomostraca, so much depend on their physical surrounding, as pointed out by Prof. A. S. Packard, Jr., in his paper, "Synopsis of the Fresh-water Phyllopod Crustacea." Pale or transparent "races" of Branchipods have repeatedly been recorded in zoölogical journals. The morphological differences, together with a hermaphrodite, a Chirocephalus and gradual transitory stages between this pale race and *Enbranchipus vernali* Verrill, I shall soon endeavor to bring to notice.—*Carl F. Gisslers.*

[See Schmankewitch's paper on the influence of external circumstances on the organization of animals. Zeits. Wissen. Zoologie, XXIX, 1877.—*Editors.*]

A NEW SYNTHETIC TYPE.—At a recent meeting of the Zoölogical section of the Russian Association of Naturalists, Kovalevsky gave an account of *Cœloplana metschnikowii*, a new form from the Red sea, intermediate between the Cœlenterates and the Planarian worms. In its outer form it resembles the Planarians; is gray above, white below, and about three lines in length by two in breadth. The mouth is a slit-like opening in the middle of the ventral surface, and communicates with a four-lobed stomach which resembles most nearly the "funnel" of the Ctenophora; from it originate a large number of canals which radiate to the periphery of the animal and open into a ring canal which bears many cæcal appendages. On the dorsal surface, almost directly over the mouth, is a vesicle containing a number of vibratile otoliths. On either side of this otocyst is a sheath from which can be protruded a long retractile tentacle. Each tentacle is branched and corresponds in shape to those of *Cydippe* and *Eschscholtzia*, only they have no central canal but are composed of muscles. The nervous system and genitalia were not observed. The body is covered above with vibratile cilia.—*J. S. K., abs. Zool. Anzeiger*, III, p. 140, 1880.

ZOOLOGICAL NOTES.—According to Mr. R. B. Roosevelt, the fish hatching commission have raised hybrids between the following fishes: Salmon trout with white fish; salmon trout with brook trout; brook trout with fresh water herring, with California salmon, and with the California mountain trout; shad with striped bass and with herring. Of these crosses there are the young, now in the hatching-house, of the salmon trout brook trout, brook trout California salmon, and brook trout California brook trout. It is observable of all hybrids that they are usually more shy and wild than either of their parents, and that in appear-

ance they generally favor their larger parent. The cross between the brook trout and California salmon and the salmon trout and brook trout bid fair to be fine fish. Those now in the hatchery are eight inches long. It is to be hoped that further careful experiments may be made to ascertain whether these hybrids are fertile, and can produce fertile offspring. Apropos of fertile hybrids certain journals have stated that a mule in Paris has had six young, from a horse, ass and a zebra.——Mr. C. C. Lobingier, of Allegheny county, Pennsylvania, states in the *American Agriculturist*, for May, that the copperhead snake swallows its young; that he took out thirty-four young from three and a half to six inches long from four old ones. In the April number of the same paper it is claimed that rattlesnakes swallow their young. Compare the NATURALIST for May, 1868 (vol. II, p. 133).——The report on the Florida Reefs, by Louis Agassiz, is reprinted in the Memoirs of the Museum of Comparative Zoology, vol. VII, with the addition of twenty-one beautiful plates, illustrative of the reef-building corals, and an additional plate of the coralline plants. ——Dr. Harrison Allen figures and describes a fœtal walrus in the Proceedings of the Academy of Natural Sciences of Philadelphia.——Dr. Evarts describes in the *American Monthly Microscopical Journal* a new species of Ophrydium *(O. adæ)*, and Prof. D. S. Kellicott gives an account of a new Argulus *(A. stizostethii)*. ——New Diptera are described by Mr. S. W. Williston, in the Transactions of the Connecticut Academy.——An Englishman's notions about the English sparrow are given in Mr. R. McLachlan's address to the members of the West Kent Natural History, Microscopical and Photographic Society; he concludes: "If the advantages of living in a free country have not so far intensified, in America, the ultra-radical proclivities of our sparrow, as to have eliminated from his nature those certainly good qualities he possesses here, I venture to predict our generous kinsmen on the other side of the Atlantic will end by tolerating him, and, probably, by an inward conviction that the *absence* of our sparrow would leave with them, as with us, a blank impossible to fill up."——The marine invertebrates of Vancouver and the Queen Charlotte's islands, coast of British Columbia, have been investigated by Mr. G. M. Dawson, and the species enumerated by Mr. J. F. Whiteaves, with descriptions of new forms by Profs. Verrill and Smith.——As a further contribution to the subject of insect-destroying fungi may be cited a short article in the *Comptes rendus*, by MM. Brongniart and Cornu on an epidemic among Syrphus flies caused by a fungus (Entomophthora).——A new illustrated work on the Pediculi, by E. Piaget, to form two quarto volumes, is announced to be published at Leyden, by E. J. Brill, who desires subscriptions.

ANTHROPOLOGY.[1]

SYPHILIS.—In deciding the much ventilated question concerning the supposed introduction of syphilis from America into the Eastern hemisphere by the earliest Spanish explorers of the West Indies, the passage printed below may not be unimportant. It is an extract from the Caraïb-French Dictionary of Raymond Breton, page 478–479 (under the term *yaya*), and although this dictionary was published one hundred and sixty years after Columbus' discovery, it nevertheless gives a graphic account of the disease, which was then indigenous among the savages of the Island of Guadalupe, and had certainly been in existence there long before. According to the authors of the seventeenth century, syphilis was very common among some other Indian nations of southern lands. I have substituted the modern French orthography for the ancient one of the Rev. Father Breton:

Yaya: pians; *yayari hoüèe:* vérolé. C'est une maladie naturelle que l'on tient communément aux Iles, comme la grosse vérolé en France, et dont les sauvages se guérissent sans peine et sans danger, non seulement à cause de la température de l'air qui est fort égale, mais aussi a cause des puissants remèdes qui naissent sous la zone torride, et qui n'ont rien perdu de leurs facultés récentes comme ceux que l'on apporte ici de ces îles par un trajet de 1800 lieues. Ils ont le jus de l'écorce de *Chipiou* (a tree, the sap of which is exceedingly bitter), dont ils se pottent au dehors, se noircissent du jùs de Genipa et des feuilles de roseaux brûlées; ils prennent le jùs de quelques liennes (for: *lianes*) comme de l'écorce du *mibi* (a creeping plant) avec de la râpure de cul de Lambis. Quand les grosses pustules crevent, ils appliquent des plumaceaux de coton cru qui resserent les lèvres des ulcères et en empêchent la déformité. Mais autant que cette grosse vérole est peu dangereuse chez eux, quoique fort commune et que tous les remédes ci-dessus opèrent sans étuves ni vif-argent, d'autant plus la petite vérole qui est très-rare parmi-eux leur est périlleuse et comme une sorte de peste parmi nous.—*A. S. Gatschet.*

FOOTPRINTS OF VANISHED RACES.—The foregoing is the title of a work by Mr. A. J. Conant, of St. Louis, Missouri, and published by Chancy R. Barns, of the same city. As it was intended to be a popular treatise, the introductory chapter to a voluminous work entitled, "The Commonwealth of Missouri," our estimate of the volume should keep that fact in view. The writer wields a glowing pen, and in his zeal to honor "the traditions of the elders," frequently steps beyond the limits of sober truth. This remark, however, applies only to the "padding" inserted for the general reader, and not to the very valuable descriptions of the Big Mound at Saint Louis, the works in the south-western corner of the State, and those in the Ozark mountains. Mr. Conant

[1] Edited by Prof. OTIS T. MASON, Columbian College, Washington, D. C.

is the first to bring out prominently the existence and construction of barrows, or chambered mounds, in Missouri. The Big Mound, referred to above, contained a chambered tomb whose dimensions were from eight to twelve feet wide, seventy feet long and from eight to ten feet in height. This structure formerly stood at the corner of Mound street and Broadway, in St. Louis, and was entirely removed in 1869. It was one hundred and thirty feet long and thirty feet high. Its demolition drew crowds of spectators to the spot during the many weeks occupied in its removal. Mr. Conant made personal and careful examinations of the work during the whole process of destruction. His enthusiasm may be inferred from the following paragraph: "Being desirous of procuring a perfect skull, I began a careful excavation with a common kitchen knife near the feet of a skeleton, following the spinal column to the head. My work, however, was soon interrupted by the crowd of eager boys from the neighboring schools, who scrambled for the beads thrown out with each handful of earth, with such energy, that I was lifted from my feet and borne away. By the aid of a policeman I was able to finish my excavation, but without having the fortune to secure what was so much desired." Mr. Conant has devoted the leisure of fifteen years to archæology, and upon those subjects with which he is familiar, is a valued contributor to the increase of knowledge.

Spencer's Ceremonial Institutions.—Messrs. D. Appleton & Co. have just issued a volume by Mr. Herbert Spencer, entitled, Ceremonial Institutions; being Part IV of the Principles of Sociology. It is also called Vol. II of the Principles of Sociology, the first volume, yet unfinished, including Part I. The Data of Sociology; Part II. The Inductions of Sociology; and Part III. The Domestic Relations. A portion of this volume is familiar to students through the *Fortnightly Review;* but five chapters are entirely new. In their present form, the twelve chapters treat consecutively of Ceremony in general, Trophies, Mutilations, Presents, Visits, Obeisances, Forms of Address, Titles, Badges and Costumes, Further Class Distinctions, Fashion, Ceremonial Retrospect and Prospect.

Instead of marring his pages with an excess of foot-notes, the author has adopted the fashion of our best modern classical textbooks, in which the notes follow the text, and are referred to by paragraphs. A list of the titles of works consulted comes after the chapter of notes. Perhaps no living writer has done so much systematic reading as Mr. Spencer, and yet we miss from the list of authors a few names of those who, like Mr. Morgan, have done most to make us acquainted with the true inwardness of savage life. The task which the author sets before himself is to prove that ceremonial government is the earliest, the most generally diffused, and most constantly active form of control. At the same time, the idea of spontaneity is kept before the mind in opposition

to conscious choice and control. Those who are familiar with the history of discussion concerning the origin of human institutions are aware that the road pursued, the *modus operandi*, the order of sequence, can be sharply distinguished from the part played by human intelligence and choice in their evolution, or elaboration. Mr. Spencer gives the maximum weight to extraneous influences or spontaneity, allowing conscious selection to have had only a small share in the operation. Some of the author's attempts to trace mysterious customs to a natural genesis are extremely ingenious; as, kissing to smelling and licking of young (p. 15–17); the carrying of boughs or branches of trees to show that no arms are secreted (p. 22–25); all State and religious ceremonies and observances to affection for, and subjection to, the living or the dead chief; the hoarding of heads, jaws, fingers, foreskins, scalps, and other portions of an enemy's body as demonstrating prowess and witnessing to superiority; mutilations of all kinds are an advance upon taking trophies from dead enemies, since the conquered is held as a slave or vassal; present making is referred to propitiation of chiefs or gods, as an acknowledgment of submission, and from these develop tribute, taxes, fees, salaries, oblations, and church revenues; visiting is traced to the necessity of appearing statedly at court as an evidence of loyalty, and church-going and pilgrimages of all kind, to reverence for the ghost or the god; obeisances are putting the body in a position which shows that we have given ourselves up to be killed; badges are derived from trophies, and even clothing is a development of the badge rather than a prompting to protection or decency; and fashion is propitiation by the imitation of defects and shortcomings.

The decay of ceremony as we pass from militancy to industrialism is insisted on throughout the volume, and at its close. The vast amount of research in the preparation of this work, makes it a storehouse of information, even to those who may think with Mr. Tylor, that "pleasant bodily sensations" and many other motives than fear may have coöperated in ceremonial observances.

The Oriental Origin of Metallurgy.—M. Ernest Chantre is the author of an octavo monograph upon the Oriental origin of metallurgy, published in Lyon, 1879, by Pitrat Ainé, and containing thirty-two pages of text, illustrated by four plates. The author has given us many able treatises upon the archæology of the Rhone basin, and upon the Age of Bronze. The conclusions to which the author comes in the work under consideration are as follows:

1. The first metal to make its appearance in the West was bronze, and this was during the Stone age.

2. The knowledge of metallurgy, through which bronze supplanted stone as a material of implements, etc., was not the result of the local evolution of industrial ideas; but was due to importation.

3. The Age of Bronze made its appearance in Gaul, as in Scandinavia and in the north, anteriorly to all documentary history.

4. The Age of Bronze had, in France, in Switzerland, and southward, as great a development as in northern countries, and especially as in Scandinavia.

5. The Age of Bronze had in France and in Switzerland a long period of existence, which is proved by the great number of localities, amounting to more than six hundred, and by the total number of objects found isolated and in the diggings, approaching 35,000 in number.

6. The valley of the Rhone is one of the most prolific spots in Europe for bronze antiquities. Here alone about thirty per cent. of the objects have been found, or nearly 11,000 specimens.

7. The importance of the Age of Bronze and the special direction of civilization in this period are demonstrated by the transformations which metallurgy has undergone in each country.

8. These local varieties permit us at present to divide Europe into several archæological provinces with distinct characteristics.

9. Without being able to indicate definitely the origin of metallurgy, we have seen that it was certainly oriental; and that, starting probably from India, it came into Europe rather through Asia Minor than through the Caucasus.

The same mail brought another work by the same author, published in 1878, entitled, "Les Nécropoles du premier age du fer des Alpes Francaises."

ANTHROPOLOGY IN ENGLAND.—Two numbers of the *Journal of the Anthropological Institute* reach us almost simultaneously, that for Nov., 1879, and that for Feb., 1880. The former contains the conclusion of Prof. Flower's paper on the osteology of the Andamanese, and Part III of Mr. Howorth's extended and valuable researches upon the spread of the Slavic race. The February number, however, will be of greater value to the general student of ethnology. The most important papers are the following: On the relations of the Indo-Chinese and Interoceanic races and languages, by A. H. Keane; followed by Notes on analogies of manners between the Indo-Chinese races and the races of the Indian archipelago, by Col. Yule. Mr. Keane's paper will be understood from the following abstract. Five propositions are maintained:

I. Both of the great Asiatic types known as Caucasian and Mongolian have from prehistoric times occupied the Chinese peninsula.

II. The brown races of Malaysia consist exclusively of these two elements variously intermingled, the Caucasian forming everywhere the substratum.

III. The large brown race of Eastern Polynesia (our Sawaiori) consists exclusively of the Caucasian element.

IV. The Negritos, the true Autochthones of Indo-China and Western Malaysia, have been almost everywhere rather supplanted than absorbed by the Caucasians and Mongolians.

v. The Papuans, the true Autochthones of Eastern Malaysia and Western Polynesia, have been rather absorbed than supplanted, the fusion producing the Melanesians in the East, the so-called "Alfuros" in the West.

No room is left for the Malay stock, Mr. Keane holding, "that for science there is no Malay type." Again, we have prominently set forth the discovery of a large ethnical family in South-eastern Asia, allied to the Caucasian and the Malayan, speaking polysyllabic languages, *recto tono;* and it is upon this bridge that Mr. Keane passes from India to the farthest island of the Pacific. Excluding the dark races there are in the Indo-Chinese and Interoceanic area two fundamentally distinct racial types only—the yellow, or Mongolian, and the fair, or Caucasian; and, corresponding to them, two fundamentally distinct forms of speech only—the monosyllabic, spoken *vario tono*, and the polysyllabic, spoken *recto tono*. All the rest is the outcome of incessant secular interminglings. The following is a tabulated list of tribes:

I. General Scheme of Indo-Chinese and Inter-Oceanic Races.

A—Dark Races.

I. Austral — Australian, Tasmanian?

II. Negrito — Aetas of Philippines, Samangs of Malacca, Andamanese Karons of New Guinea.

III. Papuan —
- Papûans proper, Interior New Guinea, Arfaks, Nufors, Koiari, Koitapu, Aru, Waigin, Salwatty, Mysol, etc.
- Sub-Papûans East (Melanesians): Admiralty, Louisiade, New Britain, New Ireland, Solomon, New Hebrides, Loyalty, New Caledonia, Fiji.
- Sub-Papûans West: Gilolo, Floris, Ceram, Buru ("Alfuros"), Timor, Serwatty, Kissa. etc.

B—Caucasian Races (Brown).

IV. Khmer branch — Khmêrs proper, Khmêr-dom (Kuy), Sâmrê, Xong, Stiêng, Charay, Cham, Prôôn, Banhar, Cedang, Muong, Khmû, Piâk, Lawa, Xien-Mai, Muang, Lolo.

V. Sawaiori branch — Samoa, Tonga, Maori, Tahiti, Marquesas, Tuamotu, Hawaii, Tokelau, Ellice, Niué, Motu, Kerapuno, Mentawey.

C—Mongol Races (Yellow).

VI. Chinese Annamese, Siamese, Laos, Shan, Burmese, Khasia, Karen, Khyen, Talaing?

D—Mongoloid Races (Olive-brown and Brown).

VII. Malayan branch — Malays, Javanese, Sundanese, Madurese, Balinese, Atchinese, Rejongs, Tagalo-Bisayans.

VIII Sub Malayan, Pre-Malayan or Indonesian branch — Battas, Passumahs, Singkel, Lampung, Dyak, Nias, Batu, Nassau, Sumba, etc.

IX. Mikronesian branch: Pelew, Caroline, Marshall, Gilbert, Ladrones.

II. General Scheme of Indo-Chinese and Indo-Pacific Languages.

A. Indo-Chinese Family (monosyllabic, toned languages, exclusively on the mainland): Chinese, Annamese, Siamese, Lao, Shan, Burmese, Khasia, etc.

B. Indo Pacific Family (polysyllabic languages, spoken *recto tono*).

I. Mainland: Khmêr, Sâm-rê, Kuy, Charey, Cham, Stieng, Banhar, Lawa, Cedang, Muang, etc.

II. Oceanic { Malayan: Malay, Javanese, Sundanese, Balinese, Madenese, Bugis, Macassar, etc. / Sub-Malayan: Batta, Lampung, Rejong, Dyak, Gorontalo, Tagala, Bisayan, Malagasy, Formosan, etc. } Malaysian
Sawaiori: Samoan, Tongan, Mâori, Tahitian, Marquesas, Tuamotu, Hawaii, Motu, etc.
Mikronesian: Pelew, Caroline, Marshall, Gilbert.

ANTHROPOLOGY IN ITALY.—The third part of Vol. IX, of *Archivio per l'Antropologia e la Etnologia*, Florence, contains, in addition to a goodly amount of reviewing, the following original papers: Materials for Italian Ethnology, collected under the direction of the Italian Society of Ethnology, by Dr. E. Raseri, pp. 259–289; and The Age of Stone in Perugino, by Dr. Guiseppe Bellucci. The first named paper appears also in another form, entitled, Materials, &c., extracts from the Annals of Statistics, Series 2, Vol. VIII, 206 pp.

The first part of Vol. II, of Anales del Museo Nacional de México presents the continuation of three important papers: The Calendar Stone (La Piedra del Sol), by Sr. D. Alfred Chavero; The Mendoza Codex; An Attempt at the Decipherment of Hieroglyphics, by Sr. Manuel Orozco y Berra; and Annals of Cuauhtetlan.

IN A recent letter to Dr. Hayden, Dr. Paul Topinard, Secretary of the *Revue d'Anthropologie*, and curator of the Museum of the Société d'Anthropologie, expresses an earnest wish to receive all books, pamphlets and extracts, published in America, concerning Anthropology. He remarks that there is now great interest all over Europe on this subject, so far as America is concerned, and that he wishes to make a careful synopsis of all American publications for the *Revue d'Anthropologie*, for popular circulation among the French people. Address, Dr. Paul Topinard, 97, Rue de Rennes, Paris, France.

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GEOLOGY AND PALÆONTOLOGY.

A NEW GENUS OF RHINOCERONTIDÆ.—While the genus *Aphelops* must be regarded as the direct ancestor of the recent rhinoceroses with canine and incisor teeth, now confined to Asia and the Islands; the ancestral genus of the African forms and their extinct congeners, which are without the teeth named, is less known. It can now be shown that the missing genus inhabited North America, and that like *Aphelops*, it is hornless. It may be named and characterized as follows: *Peraceras* Cope; superior dentition; I. 0; C. 0; P-m. 4; M. 3; nasal bones weak, hornless.

This genus is established on a new species recently discovered by Mr. R. H. Hazard, in the Loup Fork formation of Nebraska, which may be called *Feraceras superciliosus*. It is founded on a nearly perfect skull, which lacks the lower jaw. Its size is about that of the Indian rhinoceros. It is narrowed anteriorly, but is very wide between the orbits. Posterior to these it contracts rapidly, and rises to a rather elevated occiput. Saggital crest narrow; a prominent angle above each orbit. The premaxillary bone is narrow and weak. The nasal notch extends to above the middle of the third superior premolar. The occiput is rectangular in outline, with truncate summit. Its surface above is concave, divided by a strong median crest; lower down a vertical groove intersects its lateral border. The crests of the molar teeth are rather simple, and the posterior notch is soon isolated on attrition. Wear also isolates an external median fossa of the second premolar. Length of skull from end of premaxillary bone to condyles, M. 700; length of alveolar border of premaxillary, .025; length of molar series, .315; length of three true molars, .160; width of crown of second true molar at base, .075; superciliary width, .255.

This species is nearest to the *Peraceras malacorhinus*, a species which I formerly referred to *Aphelops*, but which I have little doubt belongs to the present genus. It differs from *P. superciliosus* as follows: In the latter species the front is wider, and is plane or concave, not convex; the superior edge of the maxillary is not wide and incurved, and has not the oblique ridges; the infraorbital foramen consequently has a more lateral opening. The nareal notch does not extend so far posteriorly by the one and a half molar teeth. The occiput is wider, is divided by a median crest not found in *P. malacorhinus*, and has the vertical lateral grooves much shorter. The acute supraorbital angle is not seen in the *P. malacorhinus*.

The rhinoceroses of the Loup Fork formation whose generic position can now be ascertained, are the following: *Paraceras malacorhinus; P. superciliosus; Aphelops meridianus; A. megalodus; A. fossiger.*—*E. D. Cope.*

THE GEOLOGY OF SOUTHERN ARIZONA.—Prof. E. T. Cox writes us from Tucson, Arizona, as follows: The oldest sedimentary rocks that I have seen in this part of the Territory are limestones, that contain fossils in the same layer, of coal measure, Sub-carboniferous, and Devonian species: *Productus cora, P. semireticulatus, Spirifer lateralis? Zaphrentis* sp.? *Atrypa reticularis,* and *Heliophyllum halli?* I am inclined to place the entire limestone group as Sub-carboniferous. The rock is, wherever seen, semi-crystalline, and the fossils are very imperfect and few in number. The oldest and most persistent crystalline rock is coarse grained granite, which is readily disintegrated by atmospheric influences, and the débris mixed with fragments of the superimposed serpentine trap, basalt, porphyry, and trachites, form the mesa and valley lands of the country, and gives rise to a remarkable topography. The mountains are in low, short and narrow ranges, that seem to rise from the intervening mesas, like islands in an ocean. Where porphyry or green stone form the principal mountain rocks, they are traversed in all directions by quartz lodes or veins, that present bold crops, and in very many instances may be traced for many miles in length. These lodes are never free from ores of precious metals and in some localities the ores are sufficiently abundant to pay handsomely for mining. The Tombstone mines are now about the best paying mines on the Pacific slope. At the latter locality, granite forms the northern border of the low mountains of this precious *graveyard.* The granite is followed on the south by crystalline sub-carboniferous limestone, and the latter by quartzite and porphyry. The limestone appears to be a great mineralizer, and we generally find in it, pockets of the richest ores, assaying from $200 to $10,000 and more, in gold and silver, per ton of 2000 pounds. In localities where limestone forms the prevailing mountain rock, we find numerous and rich deposits of carbonate and sulphurets of copper, cupriferous silver, argentiferous galenite and cerrusite. All the important copper and lead ores that I know of, in Pima county, are found in the sub-carboniferous limestone or at the junction of the latter with crystalline rocks.

The cone-shaped mountains are capped with trachite, which alternates with basalt and trap, and sometimes an amygdaloid-like stone, always honeycombed, as though the once imbedded crystals had weathered out. You will also find on such mountains large beds of calcareous tufa, though not a trace of water can now be found anywhere in the vicinity, evidences of springs long since dried up. On the desert Mesas, between here and Yuma, I find imbedded in the sand and granite gravel, and forming a solid inlaid pavement, perfectly smooth pebbles of trap and basalt, that are polished as smooth as glass, are as black as tar, and glisten as though they had been japanned. Though all are finely glazed, some are covered with little pits. The polishing is done by the

drifting sand, and the black glaze is produced by the action of the hot sun on the oxide of iron, which must be partially reduced to the metallic state. The heat of the sun on the rocks on this mesa will reach fully 150° F. for some months, each year, and must produce a powerful effect on the physical character of the rocks. Indeed I am satisfied that if our sedimentary rocks were subjected to strong solar heat and moisture for a period of time, they would be completely metamorphosed. The mesas in this part of Pima county, range from 2000 to 3000 feet above sea level, and the highest mountains are from 8000 to 9000 feet above the sea. The timber on the mesas is locally mesquite, cats' claws (a species of mesquite) and palo verde, and a shrub called by the Mexicans Edonella. At an elevation of 4000 to 5000 feet, we find scrub oak, and 7000 to 8000 feet pine. These elevated regions come within the range of prevalent dew falls. While on the mesas dew is seldom or never seen.

GEOGRAPHY AND TRAVELS.[1]

THE VOYAGES OF THE WILLEM BARENTS AND THE ISBJORN IN THE BARENTS SEA.—The year 1879 will always be memorable in the record of Arctic exploration for the discovery of the Northeast passage by Nordenskiöld, of whose successful voyage accounts have been given in former numbers of the NATURALIST. He has now returned to Europe and been received with great honors at the various cities he has visited on his way to his northern home.

Other less important but still remarkable voyages into the Arctic seas were also made during the last summer.

In the NATURALIST for November, 1879, we noticed the sailing of the Dutch North Polar Expedition in the schooner *Willem Barents*, and of Capt. A. H. Markham in the yacht *Isbjorn*. Both having returned, an interesting account of their voyages prepared by Capt. Markham has been read before the Royal Geographical Society.[2]

The *Willem Barents* found the edge of the pack ice on July 5, in lat. 75° 30′ N., long. 26° E. After stopping at Vardö, the explorers took many deep sea soundings and serial temperatures and obtained dredgings in the Barents sea, arriving in the Matyushin Shar on August 6th. On the 18th they met the *Isbjorn*, and on the 20th they sailed northwards together along the west coast of Novaya Zemlya, soon separating not to meet again. The *Willem Barents*, after placing a memorial stone at Cape Nassau, took a northward course unobstructed by ice on the 54th meridian, and on September 7th they sighted high land, supposed to be Mount Brunn on MacClintock's island, Franz Josef Land, distant about sixteen miles. A broad belt surrounded the land, and the weather being threatening they turned back and arrived safely at Hammerfest on September 24th.

[1] Edited by ELLIS H. YARNALL, Philadelphia.

[2] Proceedings of the Royal Geographical Society, January, 1880.

The *Willem Barents* is thus the first vessel to sight this distant land and return in safety. This success of a small schooner confirms the judgment of those who have, since the return of the Austrian expedition, advocated the route towards the Pole by the west side of Franz Josef Land.

The *Isbjorn*, a vessel of forty-three tons burthen and fifty-five feet in length, though not able to reach quite so high a latitude, made a very interesting cruise. Sailing from Hammerfest on May 25th, they made the first ice on June 4th, about forty miles west of Goose Land, Novaya Zemlya. On June 20th, they entered the Matyushin Shar. "The scenery in this wonderfully formed channel is very grand, more especially on a fine sunny night, when the rays of the sun at a low altitude just 'bathe in deep joy' the summits of the surrounding hills. These lofty ranges raise their crests to the height of from 3000 to 4000 feet above the level of the sea. Between them undulating valleys recede into the interior, covered with such deep snow as to conceal all rocky projections, and make them resemble glaciers in their milk-white opacity, rather than stretches of country which very shortly would be covered with a rich and luxuriant Arctic flora. Occasionally deep ravines, black and sombre-looking, would separate the hills, their dark black cliffs forming a striking contrast to the universal whiteness that everywhere else predominated."

Capt. Markham noticed here the formation of ice on the surface of the water when the air temperature was as high as 39°, the temperature of the surface water being 31°. This was taking place at the mouth of a large valley where a great quantity of fresh water was discharged into the sea. Finding the strait blocked with ice, they coasted along the north-western shore of Novaya Zemlya until again stopped by ice off Cape Nassau, and had to return to the Matyushin Shar, and, after some delay, passed through it into the Sea of Kara. The point of juncture of the tides from the Sea of Barents and the Sea of Kara, was determined to be at a point near Cape Walrus. The ice in the eastern sea was found to be very heavy. One floe Capt. Markham carefully measured, and found to be thirty-one feet in thickness. This floe was over four miles in diameter. Returning to the straits, the *Willem Barents* was met as mentioned above. After their separation the *Isbjorn* succeeded in rounding Cape Mauritius carrying the British flag for the first time to the northward of Novaya Zemlya. Within thirty miles of Barents' winter quarters at Ice Haven, the refusal of the Norwegian crew to proceed further, compelled them to sail in a north-westerly direction. In lat. 78° 8′ N. they encountered a strong northerly gale, and the heavy sea "was a very sure proof that the pack was a long way off." On September 12th, they reached their highest latitude, 78° 24′ N., on the 47th meridian of longitude. They were here surrounded by loose ice. To some of the fragments soil

was still adhering, and this, and their angular, little-worn sides, as well as the increased number of birds of various sorts, some of which are rarely seen any distance out at sea, were convincing proofs of the proximity of land, which, had they not been enveloped in a dense fog, they might have seen. The position reached was about eighty geographical miles from the land discovered by Payer, which Capt. Markham believes extends in a south-westward direction. The lateness of the season now compelled a return, and they arrived at Tromsö on September 22d.

Should an attempt be made in a steam vessel to reach what is probably an archipelago of islands extending from Franz Josef Land to Spitzbergen, it will have a great promise of attaining a higher latitude than has yet been reached, especially when it is remembered that in latitude 83°, Payer saw precipitous mountain land stretching away to the north, while at the same latitude in Grinnell Land it came to an abrupt end.

Capt. Markham's collections are rich and interesting, and include many specimens of carboniferous fossils from Novaya Zemlya which agree almost species by species with those obtained by Sir George Nares at Cape Joseph Henry. It may be safely affirmed that the greater portion of the Polar region is composed of carboniferous rocks, and that the greater part of the Polar sea north of Franz Josef Land and Spitzbergen probably covers a large area of coal measures. The connection of Spitzbergen with the great range of the Ural mountains can now be shown and the beds found there could be correlated with the beds found in Baffins bay and Grinnell Land, so that a distinct belt of carboniferous and Devonian rocks circles much of the Polar region. The northern extremity of Novaya Zemlya is composed entirely of carboniferous rocks which dip beneath the sea under Franz Joseph Land towards the Pole. The identification of these fossils is so complete and certain that the history of these northern rocks now begins to be perfectly well known.

The collection also embraces about ninety botanical specimens, birds, butterflies, fishes, Crustacea and dredging results.

The *Willem Barents* is to be sent out again this summer on a third cruise.

Circumpolar Stations — The Aurora Borealis. — At the International Polar Conference held at Hamburg, in October, 1879, to consider the scheme of Count Wilczek and Capt. Weyprecht for the establishment of circumpolar observing stations, it was decided to recommend that such stations should be located in the northern hemisphere, on the north coasts of Spitzbergen and of Novaya Zemlya, the neighborhood of the North Cape, the mouth of the Lena, New Siberia, Point Barrow, West and East Greenland about 75° N. lat.; in the southern hemisphere, in the neighborhood of Cape Horn, Kerguelen or Macdonald

islands, and one of the group south of the Auckland islands. These observatories would endeavor to ascertain the answers to the following questions: 1. Are the differences in the daily periods of magnetic disturbances known to us special in the localities, or are they annual phenomena? 2. How are the disturbance-intensities in different places related to each other? 3. Does the disturbance-intensity stand in a determinate relation to one of the fundamental magnetic elements? 4. In what relation do the disturbances on one side stand to those of the other in the different parts of the Polar region? 5. How does the total intensity in the disturbances behave? 6. How far do the disturbances extend? 7. Are there fixed centers of disturbance, or do they form themselves, and shift positions like barometric depressions? 8. In what connection do the disturbances stand with regard to the zone of greatest intensity and frequency of the aurora borealis? 9. In what connection do they stand with regard to the single aurora? and 10, with the different forms of the aurora? 11. What connection is there between the magnetic phenomena of the Arctic and Antarctic regions? and 12, between them and electric earth currents.

Dr. W. H. Dall, in charge of a corps of the U. S. Coast Survey, expects to visit Behrings strait this summer, and if the season permits will go as far as Point Barrow, to enable him to report on the feasibility of establishing a station there.

A correspondent states in the Proceedings of the Royal Geographical Society, as the result of observations taken for many years in Norway, of the aurora borealis, that "the aurora is neither seen during extreme cold or northerly winds, but appears when an ordinary Arctic temperature is raised by southerly and westerly winds, and is generally followed by snow. In the south-eastern part of Norway it seems to be especially caused by south-easterly winds, which are there very moist, and rather warm. Its appearance is always accompanied by a falling barometer. In my opinion the phenomenon is due to the following causes. When a wind laden with warmth, moisture and electricity comes in contact with a body of cold air, the moisture is converted into snow, the warmth and electricity are thereby released, and the aurora is the result of the disturbance. The northern lights cannot occur in very high latitudes, because the warm moist air is cooled long before it reaches them." * * * * "The determination of the chemical elements involved, by means of spectrum analysis, is by no means the least of the numerous scientific results to be derived from Arctic exploration."

Another recent writer thus defines the principal zone of the aurora: It begins at Barrow point, lat. 72° N., on the northern coast of North America, passes over Great Bear lake towards Hudson's bay, which it crosses in 60° N. lat., sweeps near Nain on the coast of Labrador, turns to the south of Cape Farewell,

goes between Iceland and the Faroe islands, approaches North cape, rounds Novaya Zemlya and Cape Chelyuskin, nearing the coast of Asia at the bay of Nijne Kolimsk, and lastly, returns to Point Barrow.

NAVIGATION OF THE SIBERIAN ARCTIC OCEAN.—The New York *Herald* publishes a translation of a paper prepared by Prof. Nordenskiöld, on board the *Vega*, in the spring of 1879, "On the Possibility of Navigation for Commercial Purposes in the Siberian Arctic Ocean." He discusses at some length the routes and best seasons for navigation between the Obi-Yenisei and the Atlantic. As regards the feasibility of the passage westward through Behring strait, he remarks that owing to the rotation of the earth, that portion of the great warm current from the south called the Korosivo, which is deflected into Behring strait, would tend towards the east and not towards the north-west along the coast of Asia, as indicated by many charts. And that there was no such current on that coast, was proved by the investigations made by his expedition. "The currents in the sea or in the large gulf formed by Wrangell's Land, the north-east shore of Asia and the north-west shore of America, resemble rather the currents of Greenland and of the Sea of Kara. In all those waters a warm current from the south extends along the coast of the land situated to the east, and, in the sea in question, goes from Behring strait to Cape Barrow. All tends to the belief that in the waters north of Behring strait this southern current is counterbalanced—as in the Sea of Greenland and that of Kara—by a current of cold water passing a little to the west of Cape Barrow, at first toward the south, then toward the south-west. This cold current carries along considerable masses of ice formed at a great distance northward, toward the eastern coast of Wrangell's Land, rendering the access to it difficult. In the vicinity of the seventieth degree of latitude the land prevents it from following its route further to the south-west. It is probable that it is then again thrown in a north-west direction, that it traverses Long Sound in doubling the south-west point of Wrangell's Land, and that it again enters into the polar basin, flowing under the currents of the east, which are warm, but little salt, and consequently light, and which are produced by the large rivers of Siberia. It is clear that this current must exert an influence little favorable to the condition of the ices between Cape Schelagskoï and Behring strait. Other circumstances tend, however, to diminish the quantity of ice and produce along the coast an open channel, navigable perhaps every year, at least for vessels of light draught. This coast is situated under a latitude southern enough for the new ice formed along its shores in the winter season to melt in a great measure during the summer, so that at the end of the hot season there remain only great mountains of ice, agglomerated in

winter, or descending with the winds and currents from colder northern regions. Most commonly this large ice is so deep that it is grounded at 5.34 metres to 8.91 metres of water. Now, as the depth of the sea diminishes generally in a uniform manner toward the shore (save where mountains project in promontories), there remains a free channel very wide at the immediate proximity of the shore. A vessel not drawing more than twelve feet can float in all security in this water." Prof. Nordenskiöld closes with the following recapitulation:

"What I have said may be summed up in the following points:

"*First.*—This route by sea from the Atlantic to the Pacific along the northern shores of Siberia ought to be frequently navigable in a few weeks by a suitable steamer having aboard experienced mariners; but it is not very probable, from the knowledge that we actually possess of the Ice sea of Siberia, that this route will become in its totality of great importance to commerce.

"*Second.*—It may already be given as a thesis that there exists no difficulties for the utilization, as a commercial route, of the sea between the Obi-Jenisei and Europe.

"*Third.*—According to all probability the route by sea between the Jenisei and the Lena and between the Lena and Europe can be equally utilized as routes of commerce, but the going and returning between the Lena and Europe cannot be effected in the course of the same summer.

"*Fourth.*—Ulterior explorations are necessary to decide on the possibility of maritime commercial relations between the mouth of the Lena and the Pacific. The experience acquired by our expedition shows that in any case there can be introduced by that route from the Pacific into the basin of the Lena, in steamers, heavy engines and other effects which cannot be transported conveniently on sledges and wagons."

The entire absence of scurvy during the voyage of the *Vega* is attributed by Prof. Nordenskiöld to the free use of a curious little berry that springs out of the eternal ice and snow during the short summer. It bears profusely, and has a taste like the raspberry but more acid. The fruit is dried and then mixed with the milk of the reindeer, and can be carried frozen for thousands of miles. Lieut. Hovgoard states, as another reason for the good health of the party, that on no occasion was the daylight quite wanting and even on the shortest day, although the sun did not rise above the horizon, there was a couple of hours of daylight.

As experiments recently made in England show that vegetable and plant life is produced and stimulated as well by the electric as by the sun's light, its use on board of vessels in the Arctic seas might be found advisable not only as a promoter of comfort and cheerfulness but as a direct sanitary agent.

The Danish steamer, *A. E. Nordenskiöld*, which was sent out by M. Siberiakoff to the relief of her namesake, and was stranded in

August, 1879, off the east coast of Yesso has been gotten off safely. She will be refitted, placed under the command of Capt. E. Johannesen, who discovered Ensomeheden island, and will attempt the north-east passage in the reverse direction.

"Die Metamorphosen des Polareises."—This is the title of a valuable work by Capt. Weyprecht, recently published in Vienna, and treating very fully of the character, changes and movements of the Arctic ice.

The first chapter speaks of the three different kinds of ice-glacier, salt-water and fresh-water. This is followed by others discussing ice-pressures, ice in winter and in summer, and the changes in its surface caused chiefly by variations of temperature between the water below and the air above—these effects being often increased by the banks and mounds of same. The weight of these snow masses, the pressure of surrounding ice-fields driven by the winds or currents, and the forcing of large blocks over and under the ice surface are also effecting constant changes in the surface of the frozen sea. These changes are accompanied by frequent noises. Sometimes only a mere murmur is heard, but often there is a groaning and roaring as if heavily laden wagons were running over the icy surface.

Noise is conducted a long distance on the ice, and sounds at the margin of the floe often seem directly under your feet. "Whenever" Capt. Weyprecht says, "I laid down to sleep, and placed my ear against the ship's side, a humming and confusion of sounds could be heard—the combination of noises on the ice at great distances from the ship." The movements of the ice—each field possessing a different velocity, the different effects caused by the winds and currents on the various masses, owing to the irregularities of the upper and under surfaces of the fields, the slow movement of the great iceberg and the rapid velocity of many ice-fields are also pointed out as characteristic features of Arctic ice heretofore little understood.

It is to be wished that Capt. Weyprecht's investigations had extended to the shores of the Palæocrystic sea of the British expedition, where most of these phenomena are visible on a grander scale than can elsewhere be witnessed. Our knowledge of Arctic ice must continue to be very incomplete until we learn more of the origin and duration of these mightiest of all known ice masses.

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SCIENTIFIC NEWS.

— The Count de Castelnau, for many years French Consul at Melbourne, died there recently. He was an ardent student of natural history, and had pursued his studies in the various parts of the world whither his official duties led him. He was director of the scientific expedition sent by Louis Phillippe, the King of

the French, to South America, and was afterward French Consul in divers parts of the southern hemisphere. While at the Cape of Good Hope he wrote a "Memoire sur les Poissons de l'Afrique Australe." When he returned to Europe and began to put his voluminous scientific notes in order, he made the disheartening discovery that while he had been temporarily disabled, his servant had been for more than a month in the habit of using the sheets of paper on which he had bestowed so much time and labor to light the fires. He disposed of the remainder of his notes and drawings to Prof. Lacordaire, and about 1862 arrived in Melbourne, where he has since resided. Count Castelnau was an active member of the Zoölogical and Acclimatization Society of Victoria. He contributed several valuable papers on the fishes of Australia, which have been published by the society, and are recognized by naturalists as works of authority on the subject. His large work in six volumes on his exploration of South America, is one of the most valuable authorities upon the interior of Brazil, Bolivia and Peru.

— Mr. Seth Green says in a letter to the *Tribune:* "I am informed by Mr. McPherson, a fish dealer at Sackett's Harbor, that over five hundred shad, weighing from two and one-half to four pounds each, were taken in white fish nets set in deep water, off Sackett's Harbor, in Lake Ontario, during last summer. Their stomachs were full of the common food of the lake, showing that they feed in the lake, and the chances are that they never have been to salt water, and that we have added a new fish to the waters of the lake. I have opened thousands of shad taken in the Hudson, Connecticut and Potomac rivers, and hardly ever find anything in their stomachs. I think they have become land-locked, and will make Lake Ontario their home."

— A Baltimore Naturalists' Field Club has been recently organized, with its headquarters at the University. Prof. Martin is its president. The object of the club is to study the fauna, flora and geology of the neighborhood of Baltimore, to make collections illustrative of the above objects, and to accumulate data for an accurate map of the region, which shall be of use to all students of its natural history. Sections have been organized in botany, vertebrate land animals, invertebrate land animals, aquatic animals, geology and physical geography. It is proposed to make weekly excursions on Saturdays, and to hold monthly meetings at the university.

— Dr. Theodore Gill has now charge of the fish department of the Chicago *Field*, and Mr. W. H. Ballou of the natural history department. In a late number Dr. Gill published an important article on the nomenclature of the fishes mentioned in popular American books on fishing.

— The annual meeting of the Entomological Club of the American Association for the Advancement of Science, will be held at the Museum of the Boston Society of Natural History, corner of Berkley and Boylston streets, Boston, commencing at 2 P. M., August 24, 1880. It is proposed to send to every member of the American Association, and to all others who may favor the undersigned with their address for that purpose, a circular announcing the special subjects which will be presented at the meeting of the Club, and therefore, all entomologists who desire to read communications at that time, are requested to notify one of the undersigned before August 1st. This will insure a fuller discussion of the topics presented, and, it is hoped, a larger attendance. Samuel Scudder, president, Cambridge, Massachusetts; B. Pickman Mann, secretary, Cambridge, Massachusetts.

— By the last annual report of the Zoölogical Society of Philadelphia, we learn that the average number of visitors daily, last year was 591. The receipts continue to more than pay expenses, and we are glad to learn that the society has received from the executors of the will of J. W. Miller the sum of $20,000. A goodly number of animals were received. A number of boas died during the winter of a disease showing a diphtheritic condition of the alimentary canal, probably contagious in its nature. The number of animals in the garden is 942, of which 392 are mammals and 415 birds.

— Many naturalists and directors of museums may be glad to learn that Mr. J. S. Kubary, long connected with the museum Godeffroy in Hamburg, is ready to undertake the collection of specimens and information in the various branches of zoölogy and ethnography in the Pacific islands. Mr. Kubary is now in the Caroline islands, where he has been under the exclusive employ of Herr Godeffroy. The address is Joh. S. Kubary, Mpoma, N. W. Harbor, Ponape, in care of H. B. M. Consul in Honolulu.

— Dr. F. V. Hayden has recently been elected honorary member of the Yorkshire Philosophical Society, York, England; the Italian Geographical Society, Rome, Italy; the Scientific Society of Styria, Graz, Austria; the Society for the Advancement of Natural Science, Marburg, Prussia, and Verein für Erdkünde, Dresden; also corresponding member of the Société des Sciences Physiques et Naturelles, Bordeaux, France, and foreign associate of the Société d'Anthropologie de Paris. The "Société de Topographie," of Paris, has also awarded him a medal of the first class for his geological and geographical works.

— The herbarium of Dr. C. C. Parry, the distinguished botanist of many government and other expeditions, has been presented to the Davenport Academy of Sciences. It contained 15,000 named species.

— Our series of articles regarding progress in the different departments discussed in the NATURALIST, have, according to a number of letters, domestic and foreign, been highly approved by our readers. It is to be hoped that we may be encouraged to render this a permanent feature of the magazine by additions to our subscription list.

— The report for 1879 of Mr. W. A. Conklin, director of the Central park menagerie, states that the total number of animals exhibited was 1206. A goodly number of mammals and birds were bred in the menagerie. The most valuable animals on exhibition, were two black leopards, four polar bears, a two-horned rhinoceros, and a sea lion and cub.

— About half the skeleton of a *Camarasaurus*, obtained by Prof. Cope, last summer, has been shipped to Philadelphia. The bones are well cleared of rock, and fill twenty-five boxes, which weigh 6850 pounds. The complete skeleton would weigh about six tons. The bones are to be deposited in the Permanent Exhibition Building.

— We notice large numbers of mussels for sale in the fish markets of Providence, R. I., where they have been sold for some thirteen years, being bought largely by English people. We have not before heard of the edible mussel being used as an article of food on this side of the Atlantic. They are sold mostly in summer.

— Mr. A. H. Swinton, of Binfield House, Guildford, Surrey, England, desires subscriptions (price, 7s. 6d.) for a work on "the causes which propagate, distribute, and modify insects." The book will treat of the organs of sense, secondary sexual characters, and variations in insects.

— Pierre Henri Nyst, conservator of the Royal Museum of Natural History of Brussels, died on the 6th of April, in the 67th year of his age. He was well known as one of the first of the Belgian geologists and palæontologists.

— The Boston Society of Natural History celebrated the fiftieth anniversary of its foundation by a special meeting in its museum, April 28th, when addresses were made by President Bouvé, Prof. W. B. Rogers, and others.

— The French Government propose to spend nearly $500,000 in experiments calculated to drown out the phylloxera in about 18,000 acres of vineyards in L'Aude and L'Hérault.

— Prof. W. K. Kedzie, a successful teacher of chemistry and well known for his attainments in geology and zoölogy, died at Lansing, Mich., April 14th, aged thirty-nine years.

— A catalogue of the fungi of the Pacific coast, by Dr. H. W. Harkness and Justin P. Moore, has been published under the auspices of the California Academy of Sciences.

— The Harvard Library Bulletin, No. 15, contains the beginning of a bibliography of fossil insects, by Mr. S. H. Scudder.

— It is announced that Mr. Darwin has nearly or quite ready for publication, a work on the Circumnutation of Plants.

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PROCEEDINGS OF SCIENTIFIC SOCIETIES.

NEW YORK ACADEMY OF SCIENCES, May 17.—Prof. T. Egglesston read a paper on the origin of gold nuggets and of alluvial gold deposits.

May 24.—Prof. J. S. Newberry remarked on the flora and fauna of the Triassic rocks about New York; and Mr. G. F. Kunz spoke regarding the fluor spars and certain associated minerals from Missouri and Southern Illinois.

May 31.—Mr. A. A. Julien presented his observations on the Palisade range at Weehawken, N. J., and on quartz crystals as an element in the constitution of rocks.

BOSTON SOCIETY OF NATURAL HISTORY, May 19.—Dr. C. S. Minot remarked on the tongue of reptiles and birds, and Dr. M. E. Wadsworth on the age of the copper-bearing rocks of Lake Superior.

AMERICAN GEOGRAPHICAL SOCIETY, NEW YORK, May 25.—Rev. B. F. DaCosta read a paper on Arctic explorations, ancient and modern.

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SELECTED ARTICLES IN SCIENTIFIC SERIALS.

AMERICAN JOURNAL OF SCIENCE AND ARTS.—June. Physical structure and hypsometry of the Catskill Mountain region, by Arnold Guyot. Occurrence of true Lingula in the Trenton limestone, by R. P. Whitfield.

CANADIAN NATURALIST.—May 7. The history of some Pre-cambrian rocks in America and Europe, by T. Sterry Hunt. Notes on some Canadian ferns, by J. Campbell.

THE GEOLOGICAL MAGAZINE.—May. Notes on the Anomalocystidæ, a remarkable family of Cystoidea from the Silurian rocks, by H. Woodward. Notes on the history of the extinct Carnivora, by P. N. Bose. British carboniferous tubicolar Annelides, Part III, by R. Etheridge. Dr. H. Frautschold on the level of the sea.

ZEITSCHRIFT FÜR WISSENSCHAFTLICHE ZOOLOGIE.—May 7. Anatomy of *Tænia perfoliata*, by Z. Kahane. On the Tyroglyphi and allied mites, by G. Haller. On the structure and development of *Bursa fabricii*, by L. Stieda. On the primary stone canal of the Crinoids, with remarks on the comparative anatomy of Echinoderms, by H. Ludwig. New contributions to the anatomy of Ophiurans, by H. Ludwig.